COMPREHENSIVE ANALYSIS OF ETIOPATHOGENESIS AND MANAGEMENTOF SALIVARY GLAND TUMOURS

Dissertation submitted to

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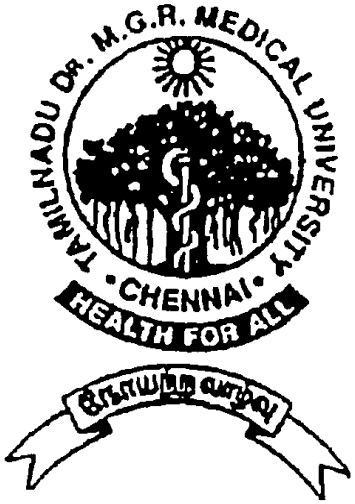
In partial fulfillment of the regulations

for the award of the degree of

M.S.BRANCH - I

GENERAL SURGERY



GOVERNMENT STANLEY MEDICAL COLLEGE AND HOSPITAL

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI-TAMILNADU

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DECLARATION

I solemnly declare that the dissertation titled **"COMPREHENSIVE ANALYSIS OF ETIOPATHOGENESIS AND MANAGEMENTOF SALIVARY GLAND TUMOURS"** was done by me at Govt. Stanley Medical College under the guidance and supervision of

PROF. K. NITHIYANANTHAN

This dissertation is being submitted to the Tamil Nadu Dr. M.G.R Medical University towards partial fulfillment of requirements for the award of M.S., Degree, and Branch I – General Surgery September 2006.

PLACE: CHENNAI **Dr. R. BALASUBRAMANIAM**

CERTIFICATE

This is to certify that the dissertation titled **COMPREHENSIVE ANALYSIS OF ETIOPATHOGENESIS AND MANAGEMENTOF SALIVARY GLAND TUMOURS"** of **Dr. R. BALASUBRAMANIAM** in partial fulfillment of the requirements for M.S Branch-1 (General Surgery) examination of The Tamilnadu Dr.M.G.R medical university to be held in September 2006. The period of study was from August 2003 to January 2006

PROF.K.NITHIYANANTHAN.M.S
Addl. Prof. of Surgery
Chief Unit – II

PROF.D.R.GUNASEKARAN, M.S
Prof. and HOD
Dept. of General Surgery

DEAN
Govt. Stanley Medical college & Hospital

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CONTENTS

INTRODUCTION

Salivary gland tumours are not only uncommon tumours but also generate much interest due to the following reasons:

i) Complex Anatomy

ii) Relative infrequency

iii) variable biological behaviour

“ The usual variant of salivary gland is a tumour in which the benign variant is less benign than the usual benign variant and the malignant variant is less malignant than the usual malignant tumour”

- Acherman L V et al.

iv) Ranks top of any organ in the number of different tumours that is capable of generating

v) in addition to the named major salivary glands there are hundreds of minor salivary glands dispersed throughout the upper aerodigestive tract.

vi) Requirement of more surgical expertise as important nerves and vessels traverse through or adjacent to them.

AIM OF THE STUDY

1. To find out the various epidemiological parameters of salivary gland tumours.

2. To analyse various risk factors.

3. To analyse the various modes of presentation of salivary gland tumours

4. To review the role of FNAC in accurately diagnosing / ruling out the salivary gland tumours.

5. To assess the incidence of minor salivary gland tumours.

6. To record the unexpected and rare varieties of salivary gland tumours.

7. To analyse the various treatment modalities and the post operative complications with special emphasis on facial nerve palsy/paresis.

8. To review the literature on the subject.

9. To compare the current study with already published data.

HISTORICAL PERSPECTIVES

The following are some of the historical perspectives leading to our current understanding of salivary gland tumours:

1656 AD	- Thomas Wharton	Submandibular Salivary gland duct
1660	- Neils Stensen	Identified Parotid duct in Sheep Head
1669	- Bartholinus	Sublingual gland
1772	- Kaltschmeid	First clinical discription of parotid tumours
1781	- **Siebold**	**Pioneer of Parotid Surgery**
1802	- Betrandi	First surgical approach to parotidectomy
1808	- **Samuel White**	**First successful removal of parotid gland**
1841	- Augusto Berard	Classification of SG tumours
1892	- **Codreanu**	**First total conservative parotidectomy**
1910-40	- Blair Sistrunk & Bailey	Various methods of facial nerve protection
1935	- Ahibom & Kirklin	Radical parotidectomy
1948	- Taylor & Garcelon	Superficial parotidectomy with conservation of facial nerve
1965	- **Hobsley & DavidPatey**	**Modern trends in conservative surgery**

EMBRYOGENESIS

Parotid Gland

Early in the sixth week of development, the parotid duct appears as a solid outgrowth of the oral epithelium. It grows posteriorly, towards the ear investing the facial nerve with its branches. The solid cords subsequently become canalized, and the cells at the tips of the branches differentiate into secretory acini.

Aberrant embryogenesis leading to congenital anomalies like congenital agenesis, accessary glandular tissues (pterygoid lobe and acessory lobe) are rare. Most common is accessory tissue (SOCIA PAROTIS) along the parotid duct, into which small ducts of the accessory tissue empty. (Anson & McVay et al)

Submandibular gland

A groove in the floor of the mouth becomes converted into a tunnel whose blind end proliferates to form the secreting acini. Its origin is almost certainly ectodermal.

ANATOMY

PAROTID GLAND

1.PAROTID REGION

The part of the face below and in front of the ear and below the zygomatic arch is the parotid region.

The principal features are the parotid gland and the masseter muscle..

2. PAROTID GLAND

The parotid gland is predominantly a serous salivary gland, with only a few scattered mucous acini. It has an irregular shape because it fills in the gap between the mastoid process, ramus of the mandible and styloid process, spilling over in

variable degrees on to the muscles attached to these bones.

It is best described as having upper and lower poles and three surfaces that are most logically called lateral, anterior and deep. It is surrounded by a tough capsule the parotid sheath, derived from the investing layer of deep cervical fascia. Mumps, a virus infection of the gland, is painful because the gland swells within this tight fibrous envelope.

The UPPER POLE is a small concave surface that adheres to the cartilage of the external acoustic meatus and lies adjacent to the capsule of the temporomandibular joint.

The LOWER POLE is rounded, lying below and behind the angle of the mandible and indented by it and sternocleidomastoid, and overlapping the posterior belly of digastric.

LATERAL AND ANTERIOR SURFACE

The lateral surface is subcutaneous and almost flat. The anterior surface (often called anteromedial) is U-shaped, clasping the ramus of the mandible with masseter on its outer surface and the medical pterygoid on its inner surface inferiorly. The stylomandibular ligament separates this surface from the medial pterygoid and from the posterior part of the submandibular gland.

The outer edge of this surface meets the lateral surface over masseter to form the convex anterior border, deep to which emerge the parotid duct and the five (groups of) branches of the facial nerve that fan out over the face. From the deeper part of this surface the terminal branches of the external carotid artery (superficial temporal and maxillary) leave the gland.

DEEP SURFACE

The deep surface (often called posteromieial) is the most irregular and

complicated. It is indented by the mastoid process and its attached muscles (sternocleidomastoid laterally and the posterior belly of digastric medially), and lies against the styloid process with its three attached muscles (stylohyoid, styloglossus and stylopharyngeus) and two ligaments (stylohyoid and stylomandibular).

The external carotid artery enters the gland through the lower part of this surface, which joins the deep edge of the anteriof surface. If the gland is large this edge extends forwards in front of the styloid process to approach the superior constrictor of the pharynx. The styloid process separates the gland from the internal jugular vein and (deeper) the internal carotid artery.

The temporozygomatic and cervicofacial branches of the facial nerve enter the gland between the styloid and mastoid processes. If the gland is retracted forwards from sternocleidomastoid and the acoustic meatus (as during parotidectomy), a small arrow-like projection of the meatal cartilage conveniently points downwards towards the nerve.

FACIAL NERVE

Embedded within the gland are the facial nerve, retromandibular vein and external carotid artery, in that order from superficial to deep.

Although the facial nerve enters the deep surface it passes forwards to become the most superficial of the embedded structures, as approached from the superficial surface. Note that the branches of the nerve emerge from behind the anterior border, not from the lateral surface. The gland is often described as having superficial and deep parts in relation to the nerve branches, as though during development the nerve had become enclosed in a sandwich of two layers of parotid tissue, but this is not a current concept.

Immediately. deep to the plane of the nerve branches is the retromandibular vein, which can be a guide to the position of the nerves; follow the tributaries of

the external jugular vein upwards into the gland, and the nerves will be found immediately superficial to the veins.

The external carotid artery and its two terminal branches are the deepest of the large structures within the gland.

Lymph nodes of the preauricular group may be within the gland substance as well as just inside the capsule, and the gland is penetrated by filaments of the auriculotemporal nerve which provide the secretomotor fibres.

PAROTID DUCT (STENSEN'S DUCT)

The parotid duct 5 cm long, passes forwards across the masseter and turns around its anterior border to pierce the buccinator. It lies in the line between the intertragic notch of the auricle and the midpoint of the philtrum and is palpable .

The duct opens on the mucous membrane of the cheek opposite the second upper molar tooth; it pierces the buccinator further back and runs forwards beneath the mucous membrane to its orifice--the valvular flap of mucous membrane so produced prevents inflation of the gland when intraoral pressure is raised.

Blood Supply

Branhes from the external carotid artery supply the gland. Venous return is to the retromandibular vein.

Lymph drainage

Lymph drains to the nodes within the parotid sheath and thence with the external arotid artery to nodes of the upper group of deep cervical nodes.

NERVE SUPPLY

Parasympathetic

Secretomotor fibres arise from cell bodies in the oticganglion and reach

the gland by 'hitch-hiking' along the auriculotemporal nerve. The preganglionic fibres arise from cell bodies in the inferior salivary nucleus in the medulla, and travel by way of the glossopharyngeal nerve, its tympanic branch, the tympanic plexus and the lesser petrosal nerve to the otic ganglion.

Sympathetic

Sympathetic (vasoconstrictor) fibres reach the gland from the superior cervical ganglion by way of the plexus on the external carotid and middle meningeal arteries.

Sensory

The gland itself receives sensory fibres from the suriculotemporal nerve, but the parotid fascia receives its sensory innervation from the great auricular nerve (C2).

SUBMANDIBULAR GLAND

The submandibular gland, mixed mucous and serous in man, consists of large superficial part and a small deep part which are continuous with one another round the free posterior margin of mylohyoid.

The superficial part fills some of the space between the mandible, mylohyoid and the investing layer of deep cervical fascia, and so has three surfaces which may be called lateral, inferior and medial.

Lateral Surface

The lateral surface lies against the submandibular fossa of the mandible, overlapping the front of the medial pterygoid insertion and being deeply grooved posteriorly by the facial artery which hooks under the mandible to reach the face at the front of the masseter muscle.

Superficial Surface

The superficial surface is covered by skin, platysma and the investing fascia and is crossed by the facial vein and the cervical branh of the facial nerve, and also by the marginal mandibular branch of the facial nerve if unusually low. Submandibular tymph nodes lie not only in contact with the surface of the gland but also within its substane -- hence the need to remove the gland as well as nodes in the operation of radical neck dissection.

Medial Surface

Most of the medial surface lies against mylohyoid and its vessels, but towards the back it overlaps hyoglossus and lingyual nerve, submandibular ganglion, hypoglossal nerve and deep lingual vein.

The deep part of the gland extends forwards for a variable distance, sometimes only a few millimetres, between mylohyoid and hyoglossis, with the lingual nerve above it and the submandibular duct and hypoglossal nerve below it.

Submandibular Duct

The submandibular duct (Wharton's) is 5 cm long, and emerges from the superficial part of the gland near the posterior border of mylohyoid. It runs forwards first between mylohyoid and hyoglossus and then between the sublingual gland and geniohyoid, to open into the floor of the mouth beside the frenulum.

Blood Supply

From the facial artery, with veins draining into the facial vein.

Lymph drainage

To the submandibular nodes.

Nerve Supply

Secretometer fibres to the gland have their cell nodies in the submandibular ganglion with a few in small ganglionic masses on the surface of the gland itself. The preganglionic fibres pass from cell bodies in the superior salivary nucleus in the pons by way of the nervus intermedius, chorda tympani and the lingual nerve.

Sympathetic (vasoconstrictor) fibres come from the plexus around the facial artery.

SUBLINGUAL GLAND

The sublingual gland is almond-shaped and lies in front of the anterior border of hyoglossus, between mylohyoid below and in front and the side of the tongue (genioglossus) medially.

Laterally it lies against the sublingual fossa of the mandible. Its upper surface raises the sublingual fold in the floor of the mouth. At the front the two glands almost meet each other; at the back each is separated from the submandibular gland by the stylomandibular ligament. The gland is mucus-secreting and of its 15 or so ducts, half open directly into the submandibular duct, the remainder separately on the sublingual fold.

It is supplied by the lingual artery and by branches of the submental artery which pierce mylohyoid muscle to reach it. The venous return is by corresponding veins. It is innervated from the submandibular ganglion.

MINOR SALIVARY GLAND

Located in the mucosa itself & present in the upper aero digestive tract, there are about 600 to 1000 glands distributed in

- Oral cavity
- Pharynx
- Nasal cavity &
- Larynx

Highest density is present in the palete.

Batsaki's has recorded choristomas in body of mandible lower part of neck hypopharynx, sternoclavicular joint and Ha et al has described a case of choristoma of middle ear.

HISTOLOGICAL FEATURES

Histological sections of the parotid gland are characterized by three features that distinguish it from the other main salivary glands: predominantly serous acini, many ducts, and fat cells scattered between the acini and ducts.

Submandibular gland

The submandibular gland, has a mixture of serous and mucous acini (including mucous acini with serous demilunes at their periphery), and few ducts.

Sublingual gland

The sublingual gland which has almost exclusively mucous acini and few ducts.

PHYSIOLOGY

Total salivary discretion is 1.25 litres per day.

Glands	Nature	% of secretion
Parotid	Serous	20%
Submandibular	Mixed	70%
Sub lingual	Mucous	5%
Minor	Mixed	5%

Function of salivary glands

Salivary glands serve various functions like deglutition and speech through its moisturising action. It also improves taste sensation through its solvent action. It aids in digestion as it contains various digestive enzymes like amylase and lipase. It also has antimicrobial functions through its IgA and Lysozyme.

Neual Control of salivary secretion.

Salivary secretion is under neural control and is largely independent of hormonal control. Stimulation of parasympathetic supply causes vasodilation of gland followed profuse secretion of watery saliva and relatively low content of organic material.

Stimulation of sympathetic causes vasoconstriction and secretion of saliva rich in organic material.

Salivary secretion is stimulated by food in the mouth in the mouth sight, smell and thought of food. There are two phases of secretion, one is resting phase and the other is gustatory phase.

ETIOPATHOGENESIS

ETIOLOGY

Low dose irradiation (causes 9 times the risk of cancer as studies from Hiroshima shows)

Smoking – Warthin's tumor

UV irradiation

EBV – Lymphoepithelial carcinoma

Silica exposure - For Parotid Carcinoma

Rubber workers exposed to nitrosamine

Early menarche & nulliparity

Genetic factors - Allelic loss of chromosme 12q leading to pleomorphic adenoma

Diet – PUFA – Protective

But except for radiotherapy and smoking effects, others are not well proved beyond doubt.

PATHOGENESIS

WHO CLASSIFICATION

Adenomas
Carcinomas
Non epithelial tumors
Malignant lymphomas
Secondary tumors
Unclassified tumors
Tumor like lesions

EPITHELIAL TUMOURS

ADENOMA	CARCINOMA
Myoepithelioma	LOW GRADE
Pleomorphic adenoma	Acinic cell carcinoma
Basal cell adenoma	Mucoepidermoid carcinoma
Warthins tumor	HIGH GRADE
Oncocytoma	Mucoepidermoid carcinoma
Canalicular adenoma	Adenoid cystic carcinoma
Sebaceous adenoma	Malignant pleomorphic adenoma
Ductal papilloma	Carcinoma Ex pleomorphic ade
Inverted ductal papilloma	Squamous Cell Carcinoma
Intraductal pailloma	Adnocarcinoma
Sialdenoma papilliferum	Oncocytic carcinoma
Cystadenoma	Salivary duct crcinoma
Papillary cystadenoma	
Mucinous cystadenoma	

NON-EPITHELIAL TUMOURS

BENIGN	MALIGNANT
Hemangioma	Rhabdomyosarcoma
Lipoma	Malignant schwannoma
Lymphangioma	Fibrosarcoma
	MFH

Melanoma

Anaplastic carcinoma

TUMOR LIKE LESIONS

oncocytosis

Necrotising sialometaplasia(salivary gland infarction)

Benign lymphoepithelial lesion

Salivary gland cysts

Chronic sclerosing sialadenitis of submandibular gland(KUTTNER'S TUMOR)

Cystic lymphoid hyperplasia in AIDS

Sialadenosis

THEROIES OF PATHOGENESIS

TWO THEORIES

Bicellular reserve cell theory

Multicellular theory

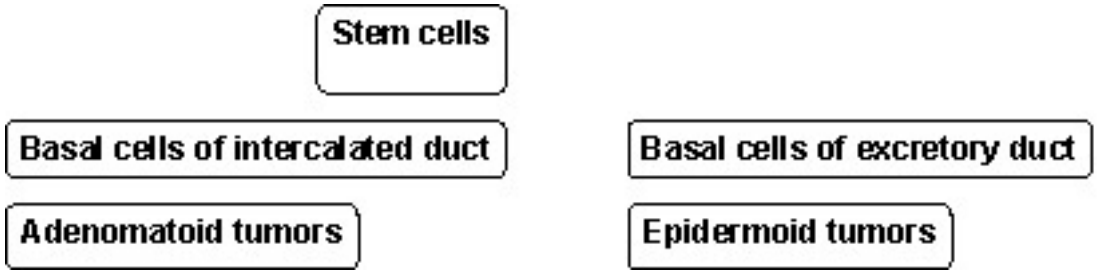
Multicellular theory

This theory states that Salivary gland tumours are derived from different cell types in the adult salivary gland units

Warthin tumors Oncocytic tumors	Striated duct cells
Acinic cell tumors	Acinar cells
Squamous and mucoepidermoid carcinoma	Excretory duct cells
Mixed tumors	Intercalated duct & myoepithelial cells

BICELLULAR OR RESERVE CELL THEORY

This theory states that tumours arise from one of these two stem cells from which mature salivary gland units arises.



BENIGN TUMOURS

Mixed tumor – Pleomorphic adenoma

It is a benign epithelial derived tumour, where both epithelial and mesenchymal differentiation are seen. It is the most common neoplasm of salivary gland origin. Parotid is the most common site. Other glands may also be involved.

It is usually solitary and most commonly associated with Warthin's tumor. Peak incidenceis in the 4th decade of life. Women > men; it is a slow growing, discrete, mobile, often multinodular, firm mass.

When recurrent , multiple nodes which are less mobile are seen often in the tail of parotid. They constitute about 10% parapharyngeal mass. They may also cause facial paralysis due to compression.

Gross pathology

- Irregular,round to ovoid mass – well defined borders
- Encapsulated – incomplete fibrous capsule
- Minor salivary – unencapsulated

- Cut surface

  Homogenous tan to white nodules connected by delicate fibrous septa

Histopathology

- Both epithelial & mesenchymal differentiation
- Epithelial - Well formed ductal structures - Squamous differentia tion- keratin pearls
- Mesenchymal component

  Myxoid, hyaline, Cartilagenous / osseous

Epithelial element predominates > 80%

Myxoid type

Myxochondromatous mesenchymal element predominates

Thickness of the fibrous capsule varies

MODERN TECHNIQUES

Special stains & immunohistochemistry

Myxochondroid areas	Heparin sulfate
Myoepithelial cells	Cytokeratin, smooth muscle actin (SMA) & S-100 protien
Ductal epithelium	Cytokeratin, epithelial membrane antigen (EMA), carcinoembryonic antigen(CEA)

Cytogenetic studies

Clonal chromosomal abnormalities, 8q12 and 12q13-15

Patients with 8q12 abnormalities are typically younger

No correlation with prognosis

Metastasizing mixed tumor

It has entirely benign histologic appearance and the most common sites are BONE & LUNG, but also to regional lymph nodes; skin; kidney; retroperitoneum; oral region; pharynx; skull; brain; even abdominal scars(1 case). It can be virulent

MYOEPITHELIOMA

Eventhough rare tumours, they are given special consideration, because of their occurence in our study.

It is a benign tumor composed of cells with myoepithelial differentiation and it is also considered as one end of spectrum of pleomorphic adenoma. Most common site is parotid involved in about 40% of cases, the intraoral minor salivary glands are less common sites of occurence (21%). Men=women. Peak incidence is 3rd decade. It presents as an asymptomatic mass.

Myoepithelioma is a rare benign neoplasm of salivary gland composed of myoepithelial cells and first described in 1943. It accounts for less than 1% of all salivary gland tumors.

Gross pathology

Well circumscribed

Often nodular

Well defined fibrous capsule

C/S solid, yellow tan and glistening

Histopathology

Three variants

Spindle cell (M.C)

Epitheloid cell

Plasmacytoid cell (hyaline cells)

Sometimes predominance of clear cells

Myoepithelioma clear cell type should be regarded as potentially malignant

Due to their infrequency and variety of histopathologic features, diagnosis of myoepithelioma is not easy by light microscopy alone. Immunocytochemistry can aid in diagnosis

WARTHIN'S TUMOR

Papillary Cystadenoma Lymphamatosum

It is the 2nd most common benign parotid tumor and occurs in parotid exclusively. It shows male predominance. Smoking is a proved etiology. It presents as a painless, sometimes fluctuant mass and is bilateral in 7%. It presents with pain, facial nerve paralysis, ear ache and tinnitus. It is usually multicentric, therefore requires wide surgical excision.

Gross pathology

Well circumscribed, ovoid nodule

Cut Section

Clear, mucoid or brown fluid, or caseous debris

Irregular cystic spaces

Small papillary excrescences

Intercystic areas may be hemorrhagic

Histopathology

Oncocytic epithelial component which form papillary projections into cystic lumina

Cystic spaces contain cast off epithelial cells , inflammatory cells , crystal-line structures or corpora amylacea

Lymphoid stroma with well developed follicles

Modern techniques

Special stains & immunohistochemistry

Luminal cells – cytokeratin

Lymphyoid stroma composed predominantly of mature B cells

B cells contain 50% IgG and 33% IGA

6p rearrangements and t(11;19) as being specific for warthin tumor

Scintigraphy

The oncocytic cell concentrates sodium per-technate (99mTc) and shows a hot nodule

ONCOCYTOMA

Rare benign epithelial neoplasm- mitochondria rich ONCOCYTES

Predominant – parotid

Peak – 7th to 9th decades

Marked female predominance in oncocytomas with clear cells

20% of pts – h/o radiation therapy to face / upper torso and are around 20 years younger

Single, encapsulated, usually solid but cysts can occur

It consists Oncocytic cells which are large cells with intensely eosinophilic granular cytoplasm and a centrally located nucleus when clear cells are present called as clear cell oncocytoma.

MONOMORPHICADENOMA

There are two types: Canalicular & Basal cell

CANALICULAR ADENOMA

Exclusively in minor salivary glands

Most common in upper lip

Women>men

Canalicular adenoma

Cells are uniformally cuboidal or columnar

Arranged in cords of single cells that form parallel canals

Thin fibrous capsule

BASAL CELL ADENOMA

M.C – Parotid

Tend to occur in the superficial lobe and are freely movable

There are four types - Solid (M.C), Trabecular, Tubular and Membranous

SEBACEOUS NEOPLASMS

Sebaceous gland rests – submandibular , parotid , rare in lingual

In buccal mucosa – FORDYCE'S GRANULES upto 80% of persons

Two benign tumors are there; Sebaceous adenoma and Sebaceous lymphadenoma

LIPOMA

It is a well encapsulated tumor, soft yellow in colour. Peak age incidence is 5th to 6th decades. Surgical removal is easy. Associated with diabetes, cirrhosis, chronic alcoholism, malnutrition & hormonal disturbances

HEMANGIOMA

Eventhough they are rare, special consideration is given because of their occurrence in our study. It is most common in newborns and infants; Girls>boys. It usually involves the superficial lobe of parotid.

It is a soft, fluid filled spongy tumour

Two types : capillary & cavernous

Usually of cavernous type

Can extend into hypopharynx & intracranially

CAPILLARY HAEMANGIOMA

Rare in parotid

More common in girls

Manifests in infants

Unilateral and compressible

Rapid enlargement & bluish discolouration of skin

Spontaneous regression

CAVERNOUS HAEMANGIOMA

Occurs in older children or early adults

Presents as solitary or diffuse soft swelling

Rapid increase in size with pain occur

TURKEY WATTLE SIGN

Masseteric hypertrophy and trismus can occur.

It is rarely pulsatile ,Facial N Palsy can also be a manifestation.

TREATMENT

Treatment of choice is total parotidectomy.

MALIGNANT TUMOURS

MUCOEPIDERMOID CARCINOMA

It is the most common malignant tumour 80-90% of the tumours occur in the parotids; hard palate is the most common site of minor gland involvement and is common next to adenoid cystic carcinoma in minor salivary glands. Males and females affected with equal frequency; peak age range 4th decade.

HISTOPATHOLOGY

Gross

They are well circumscribed but there is little or no capsule. They are often infiltrative at the margins.

Cutsection

Pale grey white revealing small musing containing cysts.

Histology

The basic pattern is that of cords, sheets or cystic configurations.

There are two cellular components – mucin-producing cells, epithelial epidermoid cells. More the proportion of mucin-producing cells, lower the grade and better the prognosis. And the grade of the tumour has influence on the prognosis and metastasis.

They may widely infiltrate the normal gland or may become fixed to the skin.

ADENOID CYSTIC CARCINOMA

It is the second-most common malignancy. 2% of parotid tumours and 15% of submand. gland tumours and is the most common malignancy of minor salivary gland tumours i.e., upto 30% of minor salivary gland tumours. Max. incidence is in the 6th decade. Commonest clinical feature is facial pain. Perineural spread is characteristic which accounts for large number of pre-op facial paralysis and is also an important route for skull-base and intracranial spread.

Hematogenous mets cause pulmonary mets and local spread leads to mandibular involvement. It varies in growth rate from slow to fast. Recurrence may occur many years after initial treatment.

HISTOPATHOLOGY

Gross

Small, poorly encapsulated, infiltrative grey pink lesions.

Histology

There are three types;

i) Cribriform (Swiss cheese) type,

ii) Solid type, and;

iii) tubular type.

The spaces between the tumour cells are often filled with a hyaline material thought to represent excess basement membrane.

MALIGNANT MIXED PAROTID TUMOUR

This has been used synonymously with carcinoma ex pleomorphic adenoma (carcinoma arising from a mixed tumour). The true malignant pleomorphic adenoma is very rare and presents in two forms: the first is the benign pleomorphic adenoma which inexplicably metastasizes and the second is the carcinoma which develops after a number of years in a previously benign tumour. The carcinoma arising in a mixed cell tumour is commoner and represents 1-6% of mixed cell lesions. It is commonest in the parotid gland, then the submandibular gland followed by the monor salivary glands of the palate, lip, paranasal sinuses, nasopharynx and tonsil. The original mass will usually have been present for 5-15 years and even when malignancy supervenes the tumour may remain grossly encapsulated. It has the worst prognosis of any salivary gland malignancy. There is an accelerated recurrence rate and a high incidence of metastases (30-70%). Most series report a 5 year survival rate of less than 40%.

ACINIC CELL CARCINOMA

This accounts for between 2% and 4% of all parotid gland tumours and like Warthin's tumour it may be bilateral (3%). It is rarely found outside the parotid

gland. The peak age incidence is the fifth decade.

These tumours are derived from two cell sources: the reserve cells of the terminal tubules, or the intercalated ducts. They may also occur in intraparotid lymph nodes, a feature shared with Warthin's tumour. They exhibit variable biological behaviour but survival rates of around 90% at 5 years make acinic cell carcinoma a much more benign tumour than mucoepidermoid carcinoma.Attempts to predict biological behaviour from histomorphological findings have not been fruitful. About 10% metastasize.

HISTOPATHOLOGY

There are two variants;

i) Classic variant, resembling normal serous salivary cells, and;

ii) clear cell variant.

The cells are disposed in sheets or microcystic, glandular, follicular or papillary patterns. There is usually little or no anaplasia and few mitoses.

SQUAMOUS CELL CARCINOMA

This is a rare tumour in the salivary glands and almost never occurs in the minor glands. Two-thirds of patients are men and the maximum age incidence is in the seventh decde. It is an aggressive tumour and shows no tendency to encapsulation. It grows rapidly causing pain, skin fixation, ulceration and facial paralysis when the parotid gland is involved. About one-half of patients have metastatic lymph glands when first seen. It appears to arise from the duct system and **some pathologists deny its existence considering such tumours to be high-grade mucoepidermoid carcinomas**. A possible source of diagnostic error in this situation is the tumour arising in a parotid lymph node as metastatic from another

head and neck site.

HISTOPATHOLOGY

MALIGNANT LYMPHO EPITHELIOMA - PAROTID

It is a very rare tumor (< 0.4% of all salivary tumours). Total no. of cases reported in major & minor salivary glands is less than 150. (Abdulla .ak et al., HEAD&NECK JOURNAL 2000 nov- dec). It is common in eskimos & asians.

It is discussed as 1 case of malignant sympho epithelioma is reported in our study. EBV. (lezzoni et al.,1995) is considered as an aetiological agent. It has wide age range, with female predominance and is common in parotid,sub mandibular-infrequent. It may arise from a benign lymphoepithelial lesion but majority arise de novo. Presents as painful mass.

It shows frequent involvement of facial n.& cervical L.N.

HISTOPATHOLOGY

It shows epithelial islands or nests.

1. Epithelial component

2. lymphoid component

Nasopharyngeal lymphoepithelioma- similar histology.

IMMUNOHISTOCHEMISTRY;

Cytokeratin; Epithelial cells are +ve

Leucocyte common antigen : Highlights lymphoid component.

MODERN TECHNIQUES IN DIAGNOSIS;

Detection – EBV genomes in malignant cells by in-situ hybridization.

DIFFERENTIAL DIAGNOSIS

Metastatic amelanotic melanoma.

Large cell lymphoma.

Benign lymphoepithelial lesion.

Metastatic nasopharyngeal lymphoepithelial carcinoma

TREATMENT

Complete surgical excision with neck dissection followed by post operative radiotherapy.

Differential Diagnosis For Parotid Tumours

Hypertrophy of masseter muscle

Winged mandible)First arch syndrome)

Neuroma of facial nerve

Preauricular node

Sebaceous cysts

Enlarged Styloid process

Ptosis of the parotid gland (chrome alcoholic)

DEEP LOBE TUMOUR OF THE PAROTID

10% of tumours occur in the deep lobe

It displaces soft palate / tonsils medially

Differential Diagnosis for deep lobe tumours

Minor salivary gland tumours

Parapharyngeal tumours

Aneurysm of ICA

Soft tissue sarcoma

Lesions of the tonsils

CLINICAL FEATURES

They usually present as painless slow-growing tumours.

Sudden increase in size may be due to ;

i) Cystic degeneration

ii) Intralesional haemorrhage

iii) Malignant transformation

Previously painless mass may become tender

Pain may be due to local ulceration, nerve and other soft tissue infilteration or may be referred pain.

Difficulty in swallowing, hoarseness, change of voice seen in parapharyngeal tumours.

Neck lumps due to cervical node metastasis

Malignant tumours especially adenoid cystic carcinoma presents with facial nerve palsy. Facial nerve palsy can also occur in other high grade malignant tumours, and in mixed parotid tumours due to compression.

Pain, numbness over the tongue in case of submandibular gland tumours.

Clinical features of malignant salivary tumours include;

i) facial nerve weakness;

ii) rapid enlargement of swelling;

iii) induration and/or ulceration of overlying skin; and

iv) cervical node enlargement

Minor salivary gland tumours

Most of them are carcinomas. They present as a painless submucosal mass initially, later ulceration develops. Perineural involvement is expressed as pain or paresthesia. Lymph node metastasis occurs as predictable sites. Important differential diagnosis, is squamous cell carcinoma for the given site.

INVESTIGATIONS

FNAC/FNAB

FNAC is defined by Bamforth (1966) et al as "The examination of cells obtained by needle or drill biopsy in solid organs or tissue masses or from the cut surface of such material freshly removed by surgical biopsy".

Fine Needle Aspiration Cytology or Biopsy is the commonest investigation performed for all the tumours. The first series of reports by Dr Martin & Ellis regarding this technique comes from Memorial Hospital for Cancer and allied Diseases, USA. First FNAC studies for Parotid gland tumours comes from Eneroth et al (1967).

The Advantages of FNAC are:

Non-expensive

Reliable and repeatable

Virtually no complications

Easy technique

Can be performed as OP procedure

Not only for diagnosis, but also for follow-up

Complication rates are very dismal.

Requisites:

Good technique of procedure

Experienced cytopathologist

Adequate Clinical Information

Technique

Tumour is grasped with one hand and fixed.

21/23G needle with syringe inserted into the tumour mass and negative pressure created

Multiple passes are made back and forth in slightly various directions maintaining the negative pressure.

Now the negative pressure is withdrawn, needle with syringe is taken out

Negative pressure is again created and is transferred to the slide for air dried giemsa staining and wet fixation with E & H or papanicaolou stains.

Various studies have confirmed an accuracy rate of 86 to 92%, sensitivity of 64 to 87% and specificity of 95 to 97%.

Useful for both neoplastic and non-neoplastic conditions.

Risk of seedling in case of malignant neoplasms is very negligble. But however it should be included insubsequent excision.

For deeplobe tumours image-guided FNAC is a well accepted and success

INCISIONAL BIOPSY

Not routinely indicated.

Risk of seedling and shedding high.

Indications

i) Skin involvement with undoubted features of carcinoma;

ii) For inoperable FNAC inconclusive tumours for pathologic confirmation and paliative treatment

iii) Minor salivary gland tumours

OTHER INVESTIGATIONS

ULTRASONOGRAPHY

New Technologies, including high-resolution probes and harmonic imaging, can delineate location, homogeneity or heterogeneity, shape, vascularity and margins of salivary tumors in the periauricular, buccal and submandibular area.

Ultrasonography may be able to reveal the type of tumor.

Ultrasonography can guide fine-needle aspiration to increase the likelihood of getting a good sample, and it can precisely guide core needle biopsies 97% of the time in an outpatient setting, which lessens the need for intraoperative biopsies.

CT/MRI

Indications

Large tumour of the parotid

Deep lobe parotid tumours

Parapharyngeal tumours

Malignant tumours

Minor salivary gland tumours

Most submandibular gland tumours

Features

Location and extent of the tumour

Nodal Involvement

Relation to major neurovascular structures

Perineural spread

Skullbase invasion

Intracranial extension

Features of malignancy

Irregular margins

Extraglandular extension

Bony destruction of the mandible/skullbase

Bone marrow involvement

Neck nodes

Perineural spread

Sublingual and minor salivary gland

Tumours

Parapharyngeal tumours

Deep lobe tumours are connected to the parotid gland in atleast one imaging section

Minor salivary gland tumours are completely surrounded by fatful method of diagnosis.

POSITRON EMISSION TOMOGRAPHY

MERITS:

Detects tumour recurrence

Distinguish tumour from post treatment fibrosis

Measures tumour metabolisim

DEMERITS:

Inconsistent uptake of FDG

Anatomic details can’t be obtained

High cost

At present it is now of research purposes only.

SIALOGRAPHY

Not useful in differentiating tumours

Can differentiate tumors from sialectasis

3D - sialography

Acinar structures visualised in detail

Entire parotid system shown in one image

Contrast between bone and parotid possible

Surface structures of parotid easily understood

SULPHUR COLLOID SCAN

It shows hot spots in Warthin's tumour and Oncocytoma. Others as cold spot

GALLIUM SCAN

It shows diagnostic spots in lymphoepithelioma and inflamatory conditions.

FLOW CYTOMETRY

The value of flow cytometry in salivary gland neoplasms is supporting histopathology by detecting possibly malignant tumors.

Flow cytometry has also been shown to help in prognosis in adenoid cystic carcinoma by determining the DNA ploidy of tumor cels. This information hasbeen shown to correlate with overall prognosis and long-term disease-free survival periods.

TNM STAGING – SALIVARY GLANDS

T 1 < =2 CM, WITHOUT EXTRAPAREN. EXTENSION

T 2 > 2 – 4 CM, WITHOUT EXTRAPAREN. EXTENSION

T 3 EXTRAPAREN. EXTENSION, & / OR > 4 –6 CM

T 4 BASE OF SKULL, 7TH NERVE, & / OR > 6 CM

N 1 IPSILATERAL SINGLE , < = 3 CM

N 2 IPSILATERAL SINGLE > 3 - 6 CM

IPSILATERAL MULTIPLE < = 6 CM

BILATERAL, CONTRALATERAL < = 6 CM

N 3 > 6 CM

M0 - No distant mets

M1 - Distant metastasis present.

STAGE GROUPING

STAGE I	T1,2	N0	M0
STAGE II	T3	N0	M0
STAGE III	T1,2	N1	M0
STAGE IV	T4	N0	M0
	T3,4	N1	M0
	ANY T	N2	M0
	ANY T	N3	M0
	ANY T	ANY N	M1

PROGNOSTIC INDICATORS FOR PAROTID CA

1) Grade of the tumour

2) Lymph node Metastasis

3) VII Nerve Palsy

4) Type of gland Non-parotid involvment

5) Staging III & IV

6) Positive Surgical Margins

7) Perinevral Spread

FIVE YEAR STUDY RESULTS (FRAZELL)

MEC - Low grade	- 96%
Acinic Cell Carcinoma	- 82%
Malignang Mixed tumour	- 55%
Solid adeno Carcinoma	- 48%
Adenoid Cystic Carcinoma	- 40%
Squamous Cell Carcinoma	- 36%
Undiff Carcinoma	- 24%
MEC - High grade	- 14%

TREATMENT

There are 3 methods of Treatment:

1) SURGERY

2) RADIOTHERAPY

3) CHEMOTHERAPY

SURGERY

Surgery for Parotid Gland	:	SUPERFICIAL CONSERVATIVE PAROTIDECTOMY
		TOTAL CONSERVATIVE PAROTIDECTOMY
		RADICAL PAROTIDECTOMY
		ROLE OF NECK DISSECTION
Surgery for SM Gland	:	SUBMANDIBULAR GLAND EXCISION
		SUBMANDIBULAR TRIANGLE DISSECTION
Facial Nerve	:	METHODS OF IDENTIFICATION
		METHODS OF PROTECTION
		REPAIR
		REHABILITATION

SUPERFICIAL CONSERVATIVE PAROTIDECTOMY

It is the most common procedure for parotid gland pathology. Surgery is performed under ET-GA with/without hypotensive anesthesia to facilitate dissec-

tion.

Important steps are:

1. Varieties of Incisions have been used over years. Most Common: 'Lazy S' Preauricular -mastoid-cervical incision.

2. Anterior Skin flap developed just below the parotid fascia upto anterior border of parotid gland.

3. Dissection continues in the posterior direction to free the posterior margin of parotid.

4) Sternocleido mastoid retracted and GAN divided.

5) Gland gradually mobilized by sharp dissection upto and to the anterior aspect of mastoid process identifying posterior belly of digastric.

6) Second avascular plane opened in front of tragus.

7) Facial trunk identified and dissected out along its length.

8) Scissor dissection in the perineural plane above the nerve anteriorly exposes its branches.

9) Facial branches dissected out starting with upper division, freeing the superior lobe.

10) Cut facial nerve can be dealt with immediately (see later)

11) In this way, the superficial and its associated tumour are mobilized in a superior to inferior dissection.

12. Hemostasis secured

13. Suction drain kept for 24-48 hrs.

14) Wound closed in layers.

TOTAL CONSERVATIVE PAROTIDECTOMY

It is done for malignant tumours and tumours involving deep lobe.

In addition to the above steps, the deep lobe is also completely excised taking care to preserve the facial nerve and its branches.

RADIAL PAROTIDECTOMY

It is performed for patients when there is a clear evidence of high grade malignant tumour with extensive VII N infiltration. For example SCC as in our case.

This involves removal of all parotid gland tissue and elective sectioning of the facial nerve; usually through the main trunk. The surgery invitably removes ipsilateral masseter and also requires simultaneous neck dissection.

NECK DISSECTION

Where there is no doubt that neck dissection should be performed for malignant parotid tumours with clinically positive nodes. There is no consensus regarding prophylactive neck dissection.

Frankenthelin et al M.D. Anderson Cancer Centre has suggested neck dissection only in clinically positive nodes where as Perzick et al advocates prophylactive neck dissection for malignant mixed tumour, high grade mucoepidermoid carcinoma and adenoid cystic carcinoma.

It is now, generally accepted that if nodes are clinically/radiologically positive, neck disssection should be done.

SUBMANDIBULAR GLAND EXCISION

For benign tumours, excision of the gland with a cuff of normal tissue is the treatment of choice.

For frankly malignant tumours, radical/modified radical neck dissection involving levels I, II & III need to be done, sometimes necessitating the sacrifice of nerves.

Important steps are:

* Performed under endotracheal general anaesthesia

* Incision should be marked at least 3-4 cm below the lower border of the mandible to avoid damage to the marginal mandibular branch

* Sharp dissection is performed down to the platysma muscle

* Platysma muscle is incised and the wound margins retracted.

* The underlying investing layer of deep cervical fascia is then divided

* The marginal mandibular branch of the facial nerve normally runs on the deep surface of the platysma muscle

* Deepening the incision divides the submandibular gland capsule

* For tumours of the submandibular gland, extracapsular dissection by suprahyoid neck dissection is performed

* The superficial lobe of the submandibular gland is first mobilised by retracting superiorly with Allis forceps

* Dissection posteriorlty subsequently identifies the facial artery, which either enters or passes around the submandibular gland. This artery is divided to facilitate further mobilisationof the gland

* The gland is further dissected by blunt and sharp dissection

* Dissection in the anterior aspect of the superficial lobe ultimately identifies the mylohyoid muscle.

* An important landmark in submandibular gland dissection is the posterior border of the mylohyoid muscle. Once identified, it can be retracted forwards, revealing the deep lobe of the submandibular gland.

* The submandibular gland is now retracted inferiorly, invariably attached to the lingual nerve

* The gland is now pedicled entirely on the submandibular duct, which can be identified and ligated

* The hypoglossal nerves lie deep to the submandibular capsule and should not be damaged during intracapsular dissection.

For large tumours, projecting beyond the SM gland are best served by suprahyoid neck dissection carefuly protecting marginal mandibular branch, lingual and hypoglossal nerves.

FACIAL NERVE

For any surgeon doing parotid surgery, the Identification & Protection of facial nerve is the most important step which needs surgical skills. The following are some of the tips that aid in identification and preservation of facial nerve.

1) ET - GA: Hypotensive anesthesia to facilitate dissection, improve the surgical field and to reduce blood loss.

2) Skeletal muscle relaxants avoided to facilitate intraoperative facial nerve monitoring like EMG monitoring of facial musculature (or) nerve localistion by electrical stimulation

3) Complete familiarity about the surgical anatomy of parotid region, by the surgeon.

4) Hemostasis should be absolute throughout the surgery which reduces the incidence of nerve injury. Special instruments like Shaw Scalpel and Bipolar scissors with saline irrigation can be used

5) Disisection done either trunk first method (popularised by Martin) or peripheries first, (Sistrunk, Hobsley, Bailey --> Mandibular branch dissection first; Reissner --> dissection starts from Zyg. arch where the branch is constant in position).

6) Landmarks commonly used to identify facial nerve trunk.

a) Inferior position of cartilagenous canal --> Conley's Pointer

b) Upper border of the posterior belly of digestive muscle.

Once the facial nerve is damaged accidentally or intentionally, the various repair and rehabilitation procedure are available. The surgeon must consider patient's needs before planning for surgery for Facial Palsy.

FACTORS INFLUENCING FACIAL REANIMATION PROCEDURE:

1) Status of proximal nerve

2) Status of the distal nerve

3) Status of facial muscles

4) Integrity of the donor nerves

5) Length of time since transection

6) Neural scarring

7) Age

8) Radiation therapy

9) Diabetes

EARLY RECONSTRUCTION:

Usually done during initial surgery.

Frozen section confirmation of negative margins of nerve ends are required

Nerve grafts harvested from

a) Contralateral greater auricular nerve

b) Sural nerve)

c) Median cutaneous nerve of forearm

d) Cervical branches from C3, C4.

Proximal and distal ends should be transacted cleanly.

4 epineurial sutures are usually necessary to seal the epineuria around.

Return of function can be expected within 6-9 months.

The axon grows at the rate of 1 mm per day.

DELAYED GRAFTING

When more than 3 days have elapsed after nerve transaction, the technique of cable grafting differs, because the distal nerve segment may not be easily found.

The surgeon should have pre conceived map to find these distal branches.

The proximal site for cable grafting can be any portion from brain stem distally, depending on site and nature of facial nerve injury.

PROCEDURES CAN BE DIVIDED INTO

A. DYMAMIC REANIMATION

a) Interposition nerve grafts

b) Cross over re-innervation procedures

Hypoglossal
Ansa - Hypoglossi
Trigeminal and cross facial

B. STATIC REANIMATION

1) Eye lid procedure

a) gold weight

b) spring

c) lower lid tightening

2) Brow and Forehead lift

3) Correctiono of mid facial deformities

4) Slings - fascia lata
Alloplastic sheets
Malar augmentation

5) Face lift

6) Lower lip wedge resection

RADIOTHERAPY

Adjuvant RT is given postoperatively in the following settings [Dose: 6000-7000 cGy in 30 Fractions]

i) Stage III/IV

ii) High grade malignant tumour

iii) Positive resected margins

iv) Recurrent tumours

v) Documented lymph node metastasis

vi) Bone/connective tissue involvement. PO RT reduces the recurrence ratio from 29.6% to 9.1%

Indications for RT as a single modality

a) an unresectable disease.

b) Patient not willing for surgery

c) Comorbid illness precluding surgery

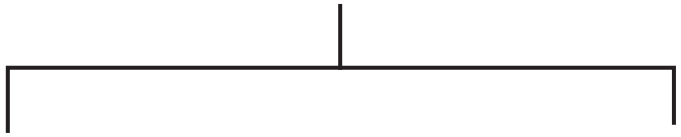
Indications for RT in benign tumours (3000 to 5000 cGy in 17-25 fractions)

a) Recurrernt pleomorphic adenoma

b) Unresectable/incompletely resected tumours.

c) Benign lymphoepithelial lesions.

COMPLICATIONS OF PAROTID SURGERY



GENERAL

- Haemorrhage
- Haematoma
- Seroma
- Wound Infection
- Flap Necrosis

SPECIAL

1. Nerve Injury
   a. Facial Palsy
   b. Frey's syndrome
   c. Greater auricular nerve injury
   (leading to anasthesia of earlobe)
2. Facial contour defect
3. Salivary fistula
4. Sialocele.

FREY'S SYNDROME (Gustatory sweating or auriculotemporal nerve syndrome)

Results from aberrant regeneration of Autonomic fibres (mediating salivary secretion) to cholinergic receptors in skin and sweat glands.

Stimuli that ordinarily promote parotid gland resection results in erythema over parotid region and facial sweating

Clinically apparent Frey's syndrome occurs in 35-60% patients.

Sub-clinical Frey's can be demonstrated by starch Iodine test.

Treatment

Directed towards blocking the abnormal neural pathway.

a) Topical application of Scopalmino hydrobromide cream (3%)

b) Division or avulsion of auriculotemporal nerve.

c) Intra cranial sectioning of IX nerve

d) Alcohol injection of ganglion

e) Excision of affected skin and grafting the defect.

f) Systemic atropino

g) Facia lata interposition

COMPLICATIONS OF SUBMANDIBULAR GLAND EXCISION

1) Hematoma

2) Wound Infection

3) Nerve Injuries: Marginal mandibular nerve

` Hypoglossal nerve

Lingual Nerve

Nerve to mylohyoid
(--> submental skin anesthesia)

COMPLICATIONS OF RADIOTHERAPY

1) Xerostomia
2) Mucoritis
3) Trismus
4) Dental caries
5) Hair loss and skin changes.

CHEMOTHERAPY

Chemotherapy is given mainly for palliation in inoperable cases and rarely as adjuvant therapy.

Main drugs used are cisplatinum, 5- plurouracil, Adriamyani, cyclophosphamide, epirulium, Bleomycin etc in various combinations [CAP, PAB regions].

MATERIALS & METHODS

This study was conducted in Government Stanley Medical College Hospital, Chennai, from August 2003 to January 2006 for a period of 30 months.

INCLUSION AND EXCLUSION CRITERIA

All patients who came with history of swelling in the salivary gland regions, were taken up for the study. A thorough history and clinical examination were done for all patients as mentioned in the proforma. In addition to routine investigations, FNAC was done for all patients. Other and special investigations like Incisional Biopsy, CT Scan, Excisional Biopsy were done for appropriate patients who needed them.

But a few who absconded while halfway through their treatment plannings were excluded from the study. Also few patients whose results came as one other than salivary gland neoplasms were also excluded from the study.

Treatment planning was done as appropriate depending on clinical findings and investigation results. Patients underwent either surgery alone or radiotherapy alone or surgery and adjuvant radiotherapy. Postoperative complications were recorded. All patients were followed up for a period ranging from 1 to 7 months.

Results and observations of the study follows:

RESULTS & OBSERVATIONS

A master chart is designed from the data collected during the study period and various epidemiological and other statistical details are analysed, results tabulated and graphs/charts given at appropriate places to make easy understanding.

AGE & SEX

Of the 60 patients who underwent our study, there are 29 males and 31 females showing a very slight female preponderance (sex ratio = 1:1.06).

There were patients ranging from lowest age of 11 years to highest age of 82 years

The following statistics are calculated:

Mean age = 42.1 years

Median age = 40 years

Age stratification data shows following details:

Age Group	No.of patients	Percentage
1-10	0	
11-20	2	3.3%
21-30	10	16.07%
31-40	22	36.7%
41-50	13	21.7%
51-60	6	10%
61-70	5	8.3%
71-80	1	1.7%
>80	1	1.7%
Total	60	100%

The above data shows that 4th decade (31-40 yer) is the most common age group for salivary neoplasms (37%) closely followed by 5th decade (41-50 yrs) which is 22%

GLANDS

Regarding gland involvement, our study shows that parotid gland is the most common salivary gland (82%) involved followed by submandibular gland (15%) and minor salivary gland (3%). There was no sublingual gland tumour detected in our study.

GLAND	M	F	Total % (n)
PAROTID	(n=24)	(n=25)	81.6% n(=49)
SUBMANDIBULAR	(n+4)	(n=5)	15% (n=9)
MINOR SALIVARY GLANDS	(n=1)	(n=1)	3.3% (n=2)

BENIGN VS MALIGNANT

Out of 60 cases studied, 10 were malignant tumours (16.6%) and 50 were benign tumours (83.4%)

Of the 10 malignant tumours (16.6%) 80% (n=8) were in the parotid gland and 20% (n=2) of them were in the minor salivary gland. There were no sub-mandibular malignancies recorded in our study.

Of the benign tumours, (n=50), 82% of them were in the parotid gland (n=41) and 18% (n=9) of them were in the sublingua gland. There were no benign tumours in the minor salivary gland; all of them were malignant.

The results are tabulated based on benign and malignant tumours in various salivary glands in our study.

GLANDS AND TUMOURS

Gland	**Benign**	**Malignant**	**Total**
Parotid	41	8	49
Submandibular	9	0	9
Minor Salivary Gland	0	2	2

Percentage of benign and malignant tumours in various salivary glands (our study)

Gland	Benign	malignant
Parotid	83.7%	16.3%
Submandibular	100%	0%
Minor Salivary gland	0%	100%

Above table stressses the importance that MC Neoplasm of parotid is benign and malignant tumour is most common in minor salivary glands.

Further stratification in sex showed the following results:

	BENIGN		MALIGNANT		TOTAL		GRAND TOTAL
GLAND	M	F	M	F	M	F	
PG	20	21	4	4	24	25	49
SMG	4	5	-	-	4	5	9
MSG	-	-	1	1	1	1	2
TOTAL	24	26	5	5	29	31	60

In malignant tumours, there is equal sex incidence whereas there is a very slight female preponderance for benign tumours.

Stratification of pathological types of benign and malignant tumour

shows:

TUMOUR	MALE	FEMALE	TOTAL
BENIGN			
Pleomorphic Adenoma	19	23	42
Warthin's tumour	1	0	1
Myoepithelioma	2	1	3
Hemangioma	2	1	3
Benign lympho epithelioma	0	1	1
MALIGNANT			
Mucoepidermoid Ca	3	4	7
Malignant mixed tumour	1	0	1
Squamous Cell Ca	1	1	0
Malignang Lymphoepithelioma	1	1	0

The above table shows us certain important facts:

a) Pleomorphic adenoma is the most common benign tumour (42 of 50) accounting for 84% of benign tumours and is also the most common neoplasm (42 of 60) accounting 70%

b) Although Warthin's tumour is considered the second most common benigh tumour, there were only 1 case in our study (2%)

c) There were surprisingly 3 cases of Hemangioma and 3 cases of myoepithelioma each accounting for 6% of benign tumours.

d) Mucoepidermoid carcinoma is the most common cancer accounting for 70% of malignant tumours. Of the 8 parotid carcinomas, 5 cases were mucoepidermal carcinomas (62.5%).

100% of the minor salivary gland tumours are mucoepidermal carcinomas in our study.

SENSITIVITY AND SPECIFICITY OF FNAC

Regarding the sensitivity and specificity indices, our study shows the fol-

lowing results:

	SENSITIVITY	SPECIFICITY
Benign	86.2%	100%
Malignant	71.4%	100%
Overall	83%	100%

The specificity of FNAC is 100% for both benign & malignant conditions. but the sensitivity of FNAC is 12% (71% vs 84% for malignancy vs benign) higher for diagnosing benign than for malignant conditions. These results are comparable with other's studies as seen in "Discussion" section.

CLINICAL PRESENTATION:

		No. of Cases
Swelling only	-	46
Swelling + Pain	-	11
Swelling + Pain + VII nerve palsy	-	2
Swelling + Node	-	1

The above data shows that asymptomatic swelling is the most common presentation (77%)

- Pain is present in 13 cases (of 60) accounting for 27%

- Preopertive facial nerve involvement is seen in 2 cases - 3.3%

RISK FACTORS

Of 10 cases of malignant tumours, there were 2 smokers, 2 smokers and alcoholics and 1 was an alcoholic and all were male patients.

There were no cases of h/o irradiation before.

TREATMENT

Regarding treatment modalities, surgery alone was done for 53 cases. Of these, superficial conservative parotidectomy is the most comm9on surgery done.

Post operative RT was given for 7 cases. 6 cases for malignant parotid tumour and 1 case of recurrent pleomorphic adenoma, where total parotidectomy was done.

Wide local excision was done for a minor salivary gland tumour involving the floor of the mouth, where preoperative FNAC was inconclusive and incisional Bx showed it as squamous carcinoma. Similarly Maxillectomy was done for minor salivary gland tumour involving maxillary sinus mucosa.

Surgery	**No.of Patients**
Superficial Conservative Parotidectomy	40 (67%)
Total Conservative Parotidectomy	8 (13.3%)
Radial Parotidectomy	2 (3.3%)
WLE	1 (1.7%)
Submandibular Excision	8 (13.3%)
Left Maxillectomy	1 (1.7%)

POST OPERATIVE COMPLICATIONS

Facial Palsy:

Superficial Conservative parotidectomy - 8 of 40

Total conservative /Radical Paraotidectomy - 4of 10

20% of the cases of benign tumours who underwent superficial conservative parotidectomy developed facial nerve palsy. Most of them were neuropraxias which improved within weeks.

DISCUSSION

Our study results were compared with various previous studies and were analysed. The comparison data showed that most of our study results were comparable to previous studies and some interesting facts were also found out.

Studies from Colemann J.J., Jurkiewicz MJ et al were compared with our study.

	Previous Study	Our Study
Benign Parotid tumours	70-80%	83.7%
Pleomorphic adenoma % of benign-tumours)	80%	84%
MC age	V decade	IV decade
Correlation between FNAC & HPE	90=-94%	>80%

Benign Tumours	Stewart C J	Izandro R B	Malaita J K	Our Study
Parotid	63%	74%	70.2%	81.6%
Submandibular	36%	18%	10%	15%
Minor Salivary gland	1%	8%	19%	3.3%

The above comparison study shows that benign tumours are most common in parotid gland and malignancy incidence rises as one goes to minor salivary gland.

Regarding the mode of presentation, our study's results compared with Conley J et al showed following results:

Symptoms	Conley J et al	Our study
Swelling Only	58%	79% (46 of 50)
Swelling + Pain	20%	18% (11 of 60)
Swelling + Pain + VII N	12%	3.5% (2 of 60)

Regarding the incidence of various histopathological varieties of malignant parotid tumours (8--> parotid 2--> MSG) our studies were compared with Memorial Sloan Kettering Ca Centre (1778 Parotid tumours)

Histology	Memorial Sloan Kettering	Mayo Clinic	Our Study
Mucoepidermoid Ca	32%	27%	50%
Malignant mixed tumour	14%	10%	10%
SCC	16%	6%	10%

From Spiro R, Spiro J, Carcinoma of salivary gland, etition, 2, New york, Churchil Livingstone 1984; 645. The comparison data shows that the most common malignant salivary neoplasm in all the studies are mucoepidermoid carcinomas.

Incidence of Post-operative Facial Palsy

Rappoport et al and Izandro R B have in their studies show an incidence of 25% and 25.2% facial paresis/palsy after superficial conservative parotidectomy. Our study results show that 8 of 40 superficial parotidectomies had facial palsy/paresis which is 20% and is comparable to other studies.

Most of these facial nerve involvement is neuropraxia rather than Axonotmesis or neuronotmesis and most of them improved subsequently. It is due to handling of the field during surgery.

Incidence of malignant tumours in various salivary gland tumours compared

Gland	Maynard	Palma	Suen	Our Study
Parotid	20%	45%	30%	16.3%
Salivary gland minor	75%	100%	85%	100%

The above data sresses the fact that as we go from parotid towards minor salivary gland, the incidence of malignancy increases.

Various parameters of our study were compared with Litter Spiro R, Spiro J et al study in malignant salivary tumours.

	Litter Spiro R, Spiro J	Our Study
Age Incidence	4-6th decade	5th to 7th decade
Sex	M	Equal sex incidence
Pain	12-24%	50% (5 of 10)
VII N Palsy	8-26%	20% (2 of 10)
Nodes	25%	10% (1 of 10)
FNAC	94%	>80%

FNAC - SENSITIVITY & SPECIFITY

FNAC - Sensitivity & Specificity data for malignant tumours and benign tumours

	Sensitivity	Specificity
Benign		
Orell	85.5%	99.5%
Candel	95.7%	100%
Our study	86.2%	100%
Malignant		
Ferrel C et al	87%	99%
Stewart C J et al	87%	99%
Our STudy	71.4%	100%

The above results show that specificity for FNAC is high (99 to 100%) for both benign and malignant tumours whereas sensitivity is lesser variying from 71% to 95% in various studies. Provided adequate technique is followed, an experienced pathologist can give a FNAC report with sensitivity and specificity close to 100%.

CONCLUSION

From our study, the following conclusions are made:

1) Salivary gland nroplasms are not uncommon neoplasms

2) There is fairly equal sex incidence

3) Among the salivary gland, parotid gland is the commonest salivary gland found to be affected by neoplasms (81.6%)

4) Benign tumours especially pleomorphic adenoma is the most common neoplasm. It accounts for 84% of benign tumours and 70% of overall tumours

6. In minor salivary gland, all the neoplasms are malignant --> 100% and are mucoepidermoid carcinomas.

7) Eventhough, hemangiomas are MC parotid tumour of infancy and children, their occurrence and occurrence of other rare diseases like myoepithelioma & lymphoepithelioma accounting for 6%, 6% and 3% of benign tumours respectively in our study were rated.

8) The most common presentation is painless slow grouping tumour. Pain is present in 27% of cases and facial palsy in 3.3% of cases

9) FNAC is an important simple diagnostic tool, which shows a specificity of 100% for diagnosing tumours. The sensitivity is 83% and 71.4% respectively for benign and malignant tumours.

10) Superficial conservative parotidectomy is the most common procedure done.

11) The incidence of postopeprative facial paresis/palsy after superficial parotidectomy is 20%

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PROFORMA

Name
Age
Sex
Occupation
Address
IP No.

HISTORY

Chief Complaint/s

1. Swelling:
- **Site where started**
- **Duration**
- **Rate of growth**
- **Sudden change in size of swelling**
- **Any history of discharge/ulceration**
- **Any sudden increase in size**

2. Pain:
- **Over the swelling**
- **Referred pain**
- **Aggravated by Mastication**
- **Duration**
- **Nature**
- **Severity**
- **Radiation**

3. Other histories:
- **Salivation**
- **Nerve involvement**
  - **i) - VII Nerve**
    - **Stasis of food in buccal cavity**
    - **drooling of Saliva**
    - **deviation of angle of mouth**
    - **ocular symptoms**
  - **ii) - Lingual Nerve**
    - **taste sensation over tongue**
  - **iii) Hypoglossal Nerve**
    - **Mastication difficulty**
    - **speech difficulty**
- **h/o discharge of pus through the duct**
- **h/o bleeding from ulceration or through duct**

4. Past History: Irradiation
Previous Surgery

5. Personal history: Smoking/Alcohol/Tobacco Chewing

6. Family History:

7. Medical history: h/o DM/HT/PT

8. Menstrual and Obstetric history: For Females

GENERAL EXAMINATION

Anaemia
Hydrations
Lymphadenopathy
PR & BP

CLINICAL EXAMINATION

INSPECTION (SWELLING) :
- Site
- Lifting of earlobe
- Size
- Shape
- Surface
- Skin over the swelling
- Surroundings

PALPATION:
- Warmth
- Tenderness
- Site, Size, Shape and Surface
- Consistency
- Plane
- Mobility/Fixity
- Skin over the swelling

ORAL CAVITY:
- Bidigital palpation for Submandibular and Sublingual glands
- Salivary gland ducts - Any discharge during manipulation
- Deep lobe involvement - Bulging of lateral wall, Tonsil pushed medially, Bidigital palpation
- Others - Teeth, tongue etc.

NERVES:

Facial nerve:
Loss of wrinkling of forehead
Weakness of eyelid closure
Obliteration of nasolabial fold
Deviation of angle of mouth

Lingual nerve involvement
Taste Sensation over anterior part of tongue

Hypoglossal nerve
Tongue deviation

CERVICAL LYMPHADENOPATHY

EXAMINATION OF OTHER SYSTEMS

RESPIRATORY SYSTEM

ABDOMEN

CARDIOVASCULAR SYSTEM

CENTRAL NERVOUS SYSTEM

PROVISIONAL DIAGNOSIS:

INVESTIGATIONS

1. ROUTINE INVESTIGATIONS

2. CXR AND ECG

3. FNAC

4. OTHER INVESTIGATIONS AS NEEDED
X-Ray local part, CT Scan, Trucut biopsy etc.

TREATMENT

SURGERY	**Supl parotidectomy** **Total conservative parotidectomy** **Total radical parotidectomy** **Resection of submandibular triangle**
PEROPERATIVE FINDINGS	**Type of incision** **Infilteration** **Deeplobe involvement** **VII nerve**
	MACROSCOPIC/CUT SECTION FINDINGS
HISTOPATHOLOGICAL EXAMINATION RESULTS	
RADIOTHERAPY	
CHEMOTHERAPY	
POSTPOERATIVE COMPLICATIONS	**Uneventful** **Wound infection** **Seroma** **Skin flap necrosis** **VII nerve palsy/paresis** **Salivary fistula** **Others**

MASTER CHART Page 1														
S. No.	Name	IP. No.	Age	Sex	Gland	SIDE	Smoking	RT	Alcohol	Swelling	Pain	VII Nerve	Node	Others
1.	Balakrishnan	037132	55	M	PG	L	+			+	+			
2.	Saraswathy	026104	38	F	SMG	L				+				
3.	Thulasiammal	028979	55	F	PG	R				+				
4.	Lakshmi	028061	65	F	PG	R				+	+			
5.	Govindammal	031105	23	F	SMG	L				+				
6.	Lakshmi	029083	49	F	PG	L				+				
7.	Mani	025655	40	M	PG	R	+		+	+				
8.	Meenammal	025191	80	F	MSG	R				+	+			UG*
9.	Mani	026207	53	M	PG	R				+				
10.	Subramani	022747	65	M	PG	L	+		+	+	+	+		
11.	Muniamma	027474	60	F	PG	L				+				
12.	Shanthi	034677	41	F	PG	L				+	+			
13.	Munusami	035617	38	M	PG	R	+		=	+				
14.	Poongodi	028476	40	F	PG	L				+				
15.	Md. Shiyaz	028332	45	M	PG	R	+		+	+				
16.	Veeramma	025230	40	F	PG	L				+				
17.	Lakshmi	033147	45	F	PG	R				+				
18.	Shanmugam	039929	82	M	MSG	L	+		+	+				
19.	Ezhilarasan	037891	25	M	PG	R	+		+	+			+	ALBI
20.	Krishnan	039534	68	M	SMG	L			+	+				
21.	Bagyalakshmi	051450	41	F	PG	L				+				
22.	Guna	098238	23	M	PG	R				+				
23.	Poochi	019703	50	M	PG	R	+			+				
24.	Raji	013293	16	M	PG	L				+				
25.	Janaki	013300	35	F	PG	R				+	+			
26.	Valli	013277	40	F	PF	L				+				
27.	Perialakshmi	047595	11	F	PG	R				+				
28.	Revathy	015455	32	F	PG	L				+				
29.	Panneerselvam	015333	33	M	PG	R	+		+	+				
30	Sathaqathulla	015374	52	M	PG	R				+	+			

MASTER CHART Page 2														
S. No.	Name	IP. No.	Age	Sex	Gland	SIDE	Smoking	RT	Alcohol	Swelling	Pain	VII Nerve	Node	Others
31.	Mumtaj	039703	35	F	PG	L				+				
32.	Senthilkumar	002202	28	M	PG	L				+				
33.	Abdul Razaq	001058	60	M	PG	R	+			+	+	+		ULCER
34.	Lakshmi	003831	50	F	PG	R				+	+			
35.	Arumugam	003361	35	M	PG	L	+			+				
36.	Shanthiappan	003489	50	M	PG	R	+			+				
37.	Padavattammal	005400	37	F	SMG	L				+				
38.	Govindammal	007553	40	F	PG	R				+				
39.	Sandhya	009602	44	F	PG	R				+	+			
40.	Meenakshi	008725	31	F	PG	L				+				
41.	Kalimuthu	033391	40	M	PG	R	+		+	+				
42.	Ganesan	034589	50	M	SMG	R				+				
43.	Ramakrishnan	008523	65	M	PG	R				+				
44.	Poongodi	012671	40	F	PG	R				+				
45.	Jayapal	046519	21	M	PG	L				+				
46	Dhanashekar	045568	48	M	PG	R				+				
47.	Kannan	050778	45	M	PG	L			+	=				
48.	Krishnaswamy	051523	36	M	PG	R				+	+			
49.	Roothu	974009	39	F	SMG	R				+				
50.	Dhayalan	034301	25	M	SMG	L				+				
51.	Anjammal	035664	38	F	PG	L				+				
52.	Sasikala	036873	30	F	PG	L				+				
53.	Lakshmi	024752	70	F	PG	L				+	+			
54.	Kuttiama	026240	35	F	PG	R				+				
55,	Marimuthu	026496	24	M	PG	L				+	+			
56.	Parvathy	029357	40	F	SMG	L				+				
57.	Sambu	030982	46	M	SMG	R				+				
58.	Geetha	037247	38	F	PG	R				+				
59.	Maruthamuthu	968169	24	M	PG	L	+			+				
60.	Geetha	371667	22	F	PG	R				+				

MASTER CHART Page 1 (contd)

DIAGNOSIS			MANAGEMENT			PO BIOPSY	PO COMPLICATIONS				
S. No.	FNAC	OTHERS	SURG	SU + PORT	RT		UNEVENTFUL	SEROMA	WOUND INF	VII N PALSY	OTHERS
1.	CAP		TCP			MEC H	+				
2.	INC		SME			PLA	+				
3.	PLA	CT	SCP			PLA			+	+	
4.	PLA		SCP	+		MPA	+				
5.	PLA		SME			PLA	+				
6.	PLA		SCP			PLA	+				
7.	PLA	CT	TCP			PLA				+	
8.	CA	INB	WLE			MEC	+				
9.	PLA		SCP			PLA	+				
10.	MEC	CT	RP	+		SCC				+	
11.	PLA		SCP			PLA	+				
12.	MEC	CT	TCP			MEC-L		+	+		
13.	PLA		SCP			PLA	+				
14.	PLA		SCP			PLA	+				
15.	INC		SCP			ME	+				
16.	PLA		SCP			PLA	+				
17.	PLA		SCP			PLA		+		+	
18.	MEC		LMX	+		MEC-H			+		
19.	CA	CT	TCP			MLE				+	PM-FLAP
20.	PLA		SME			PLA	+				
21.	PLA		SCP			PLA	+				
22.	INC		TCP			HEM	+				
23.	WR		SCP			WR		+	+		
24.	PLA		SCP			PLA	+				
25.	PLA		SCP			PLA				+	
26.	PLA		SCP			PLA	+				
27.	PLA		SCP			PLA				+	
28.	WR		SCP			PLA	+				
29.	PLA		SCP			PLA				+	
30	PLA		SCP			PLA	+				

MASTER CHART Page 2 (contd)

DIAGNOSIS			MANAGEMENT			PO BIOPSY	PO COMPLICATIONS				
S. No.	FNAC	OTHERS	SURG	SU + PORT	RT		UNEVENTFUL	SEROMA	WOUND INF	VII N PALSY	OTHERS
31.	PLA		SCP			PLA	+				
32.	NODE		SCP			PLA	+				
33.	MEC		RP	+		MEC-H			+		
34.	INC	CT	TCP	+		MEC-L			+	+	
35.	PLA		SCP			PLA	+				
36.	PLA		SCP			PLA	+				
37.	INC		SME			ME		+			
38.	PLA		SCP			PLA	+				
39.	MEC	CT	TCP	+		MEC-I			+		
40.	PLA		SCP			PLA	+				
41.	PLA		SCP			PLA	+				
42.	PLA		SME			PLA	+				
43.	PLA		SCP			PLA	+				
44.	PLA		SCP			ME		+			
45.	INC		TCP			HEM	+				
46	PLA		SCP			PLA	+				
47.	PLA		SCP			PLA	+				
48.	PLA		SCP			PLA			+		
49.	PLA		SME			PLA				+	
50.	PLA		SME			PLA	+				
51.	BLE		SCP			BLE	+				
52.	PLA		SCP			PLA	+				
53.	PLA		SCP			PLA	+				
54.	HEM		SCP			HEM	+				
55.	PLA		SCP			PLA				+	
56.	PLA		SCP			PLA	+				
57.	PLA		SME			PLA	+				
58.	PLA		SCP			PLA				+	
59.	PLA		SCP			PLA	+				
60.	PLA		SCP			PLA	+				

LIST OF ABBREVIATIONS USED IN MASTER CHART:

PLA - PLEOMORPHIC ADENOMA

MEC - MUCO EPIDERMOID CARCINOMA (H = HIGH GRADE, L = LOW GRADE, I = INTERMEDITE GRADE)

INC - INCONCLUSIVE

BLE - BENIGN LYMPHO EPITHELIOMA

HEM - HEMANGIOMA

CT - CT SCAN

SCP - SUPERFICIAL CONSERVATIVE PAROTIDECTOMY

TCP - TOTAL CONSERVATIVE PAROTIDECTOMY

SME - SUBMANDIBULAR EXCISION

LMX - LEFT MAXILLECTOMY

WLE - WIDE LOCAL EXCISION

RP - RADICAL PAROTIDECTOMY

MLE - MALIGNANT LYMPHO EPITHELIOMA

WR - WARTHIN'S TUMOUR

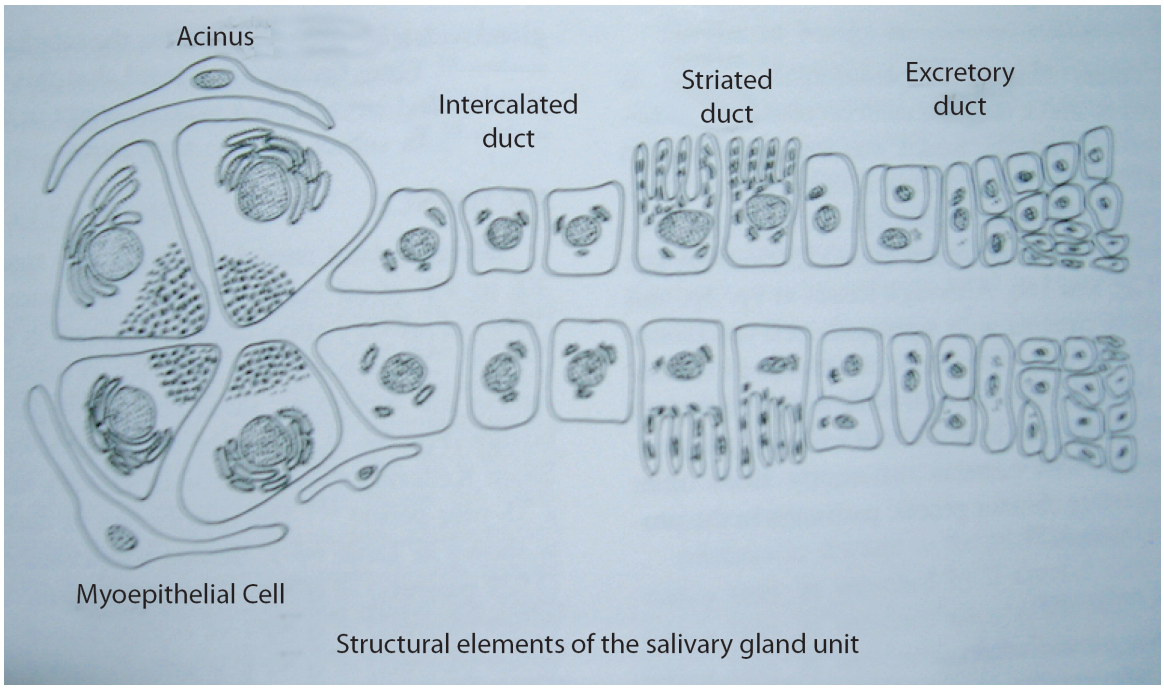
ME - MYOEPITHELIOMA

PG - PAROTID GLAND

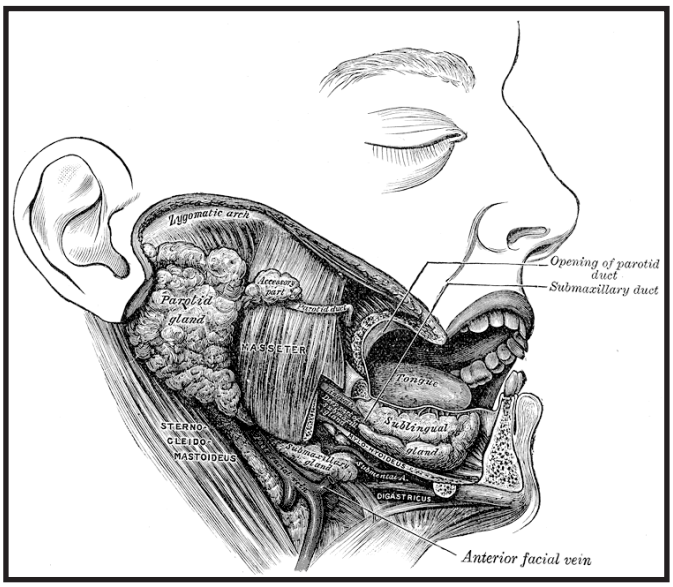
SMG - SUBMANDIBULAR GLAND

MSG - MINOR SALIVARY GLAND

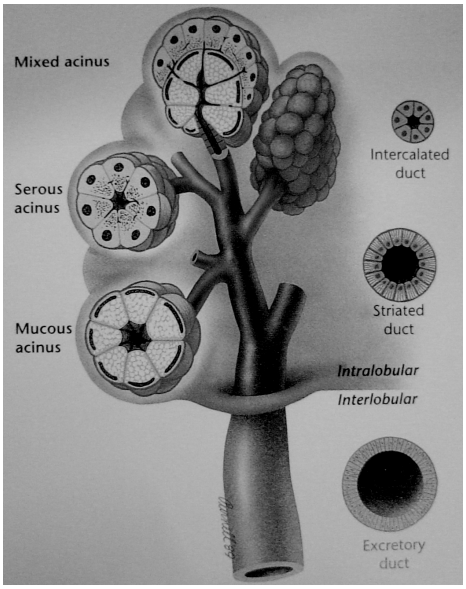
PORT - POST OPERATIVE RADIO THERAPY



Structural elements of the salivary gland unit



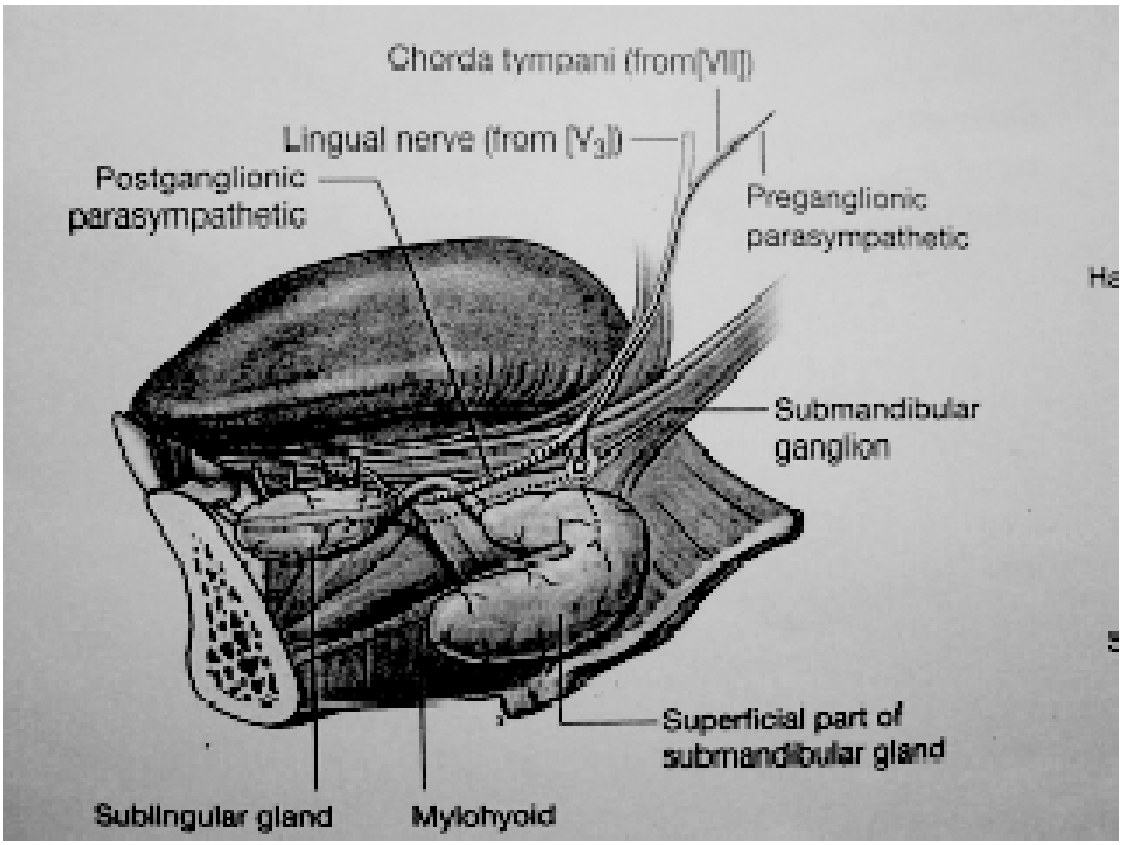
All Three Glands



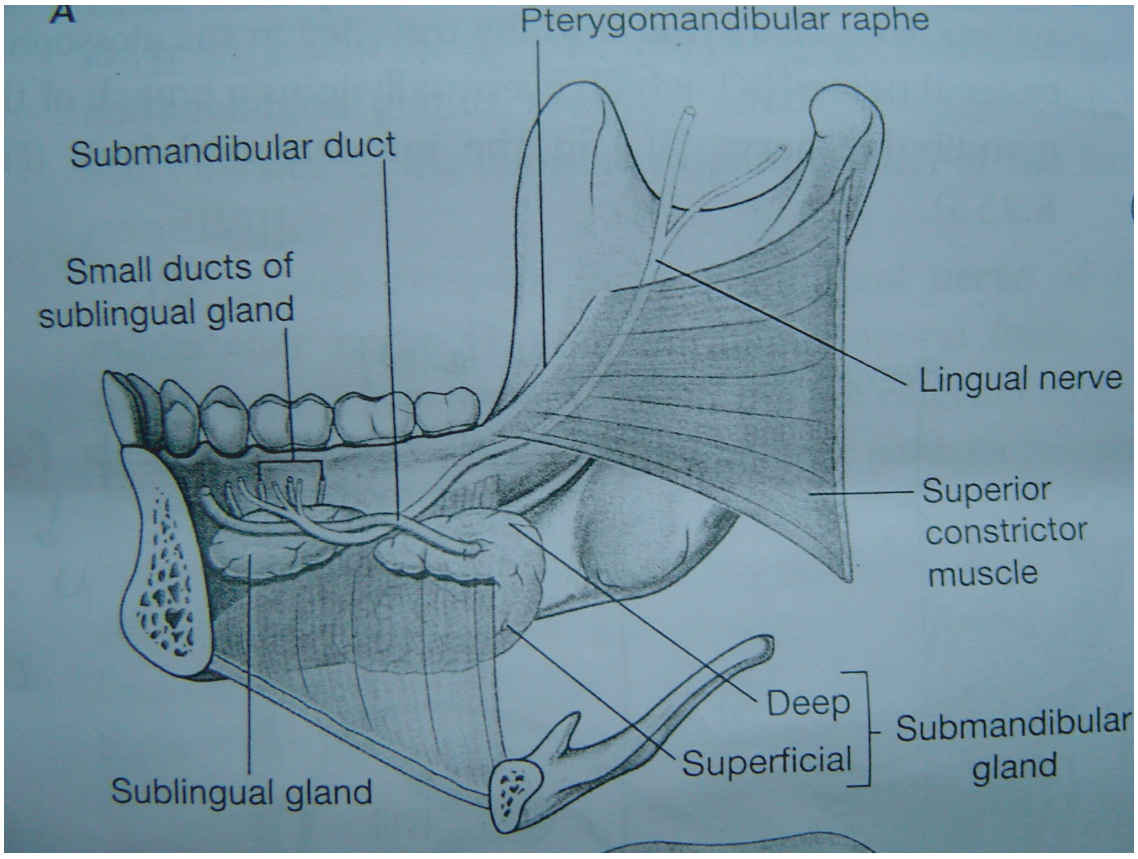
Microspic Anatomy

HUGE PLEOMORPHIC ADENOMA OF RIGHT PAROTID

PLEOMORPHOC ADENOMA
Characteristic elevation of earlobe



ANATOMY OF SUBMANDIBULAR GLAND

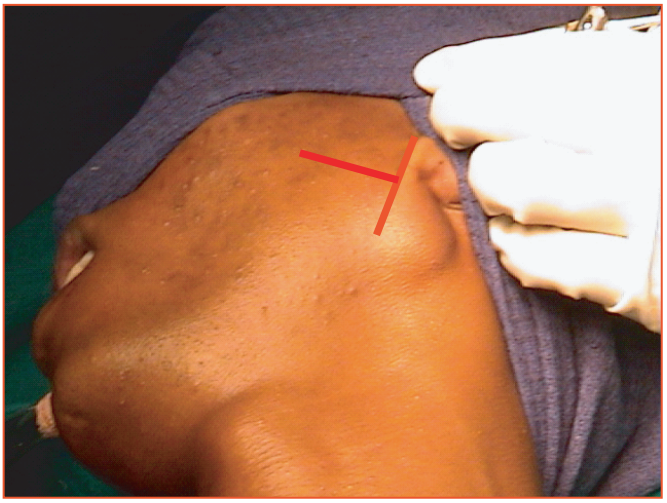


SUBMANDIBULAR GLAND - SUPL & DEEP LOBES

Parotid Mucoepidermoid Carcinoma

Submandibular Gland Swelling

Facial nerve involvement



Mumford Incision

Adson & Ott (Y incision)

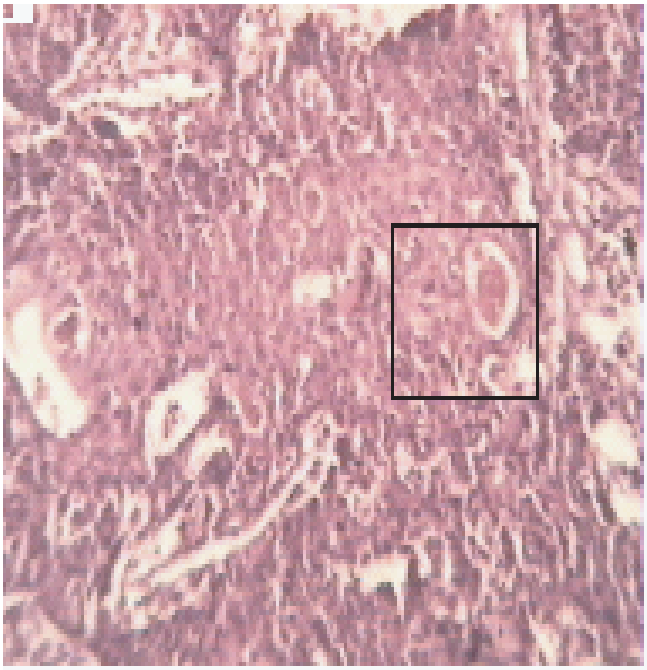
Sistrunk Incision

Blair & Bailey modification

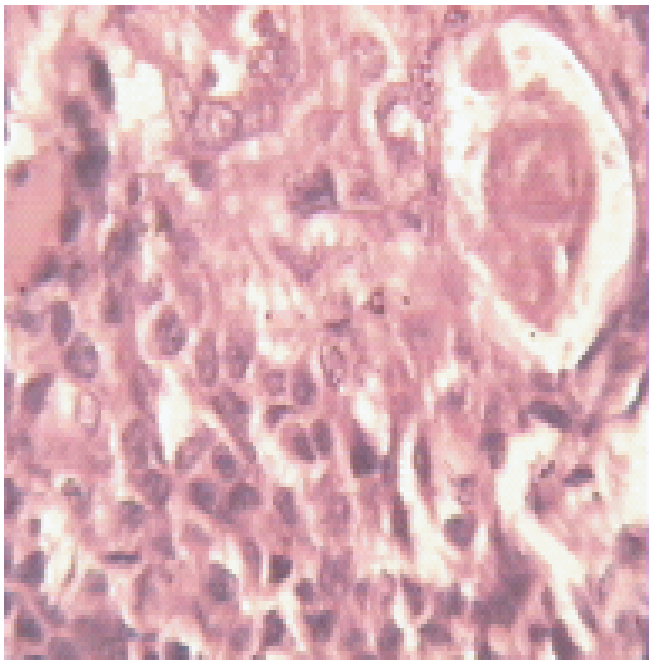
MALIGNANT LYMPHO EPITHELIOMA

HPE

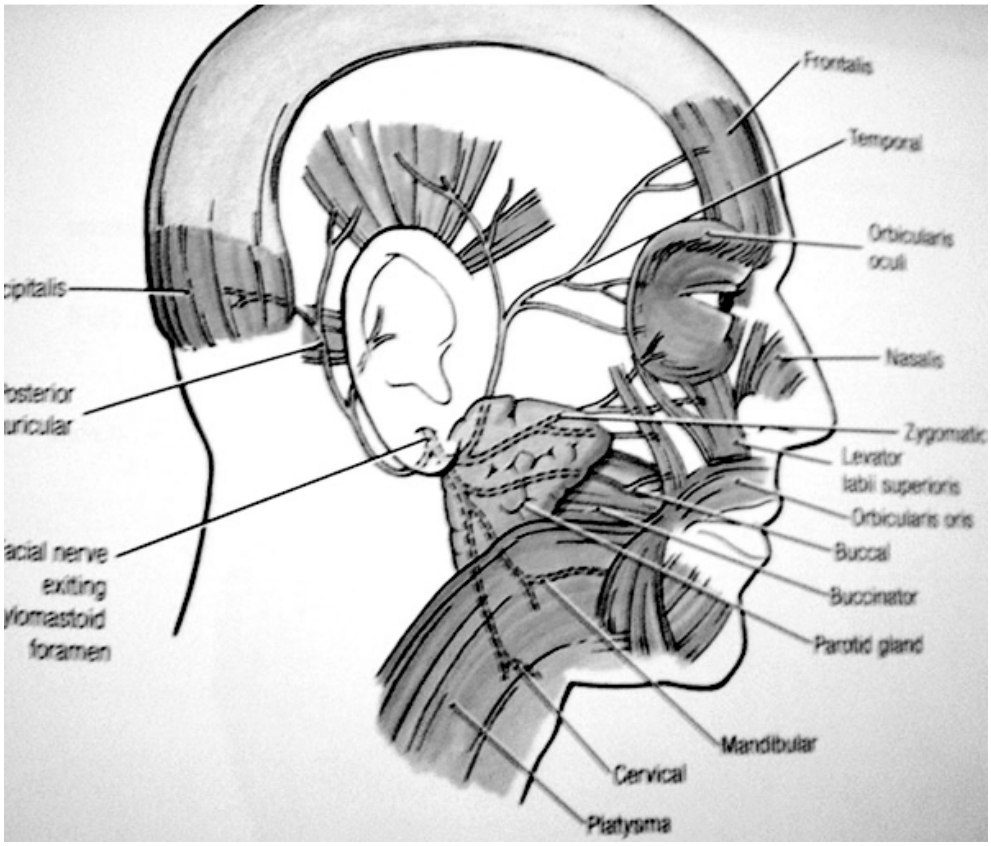
MALIGNANT LYMPHOEPITHELIOMA -PAROTID



LOW POWER FOCUS

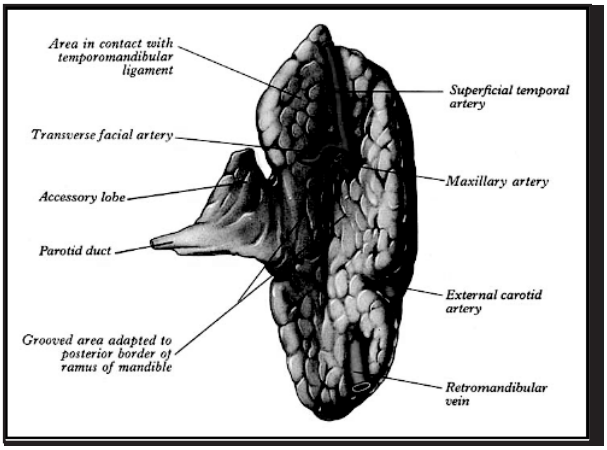


HIGH POWER FOCUS

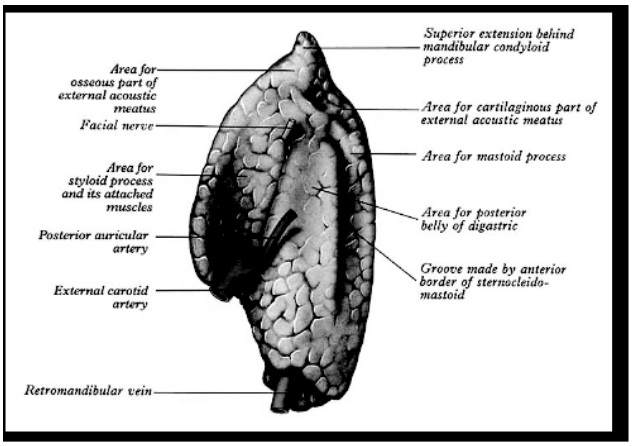


Patey's facio-venous plane - relation of the parotid to the facial nerve and major veins in the parotid region

PAROTID GLAND

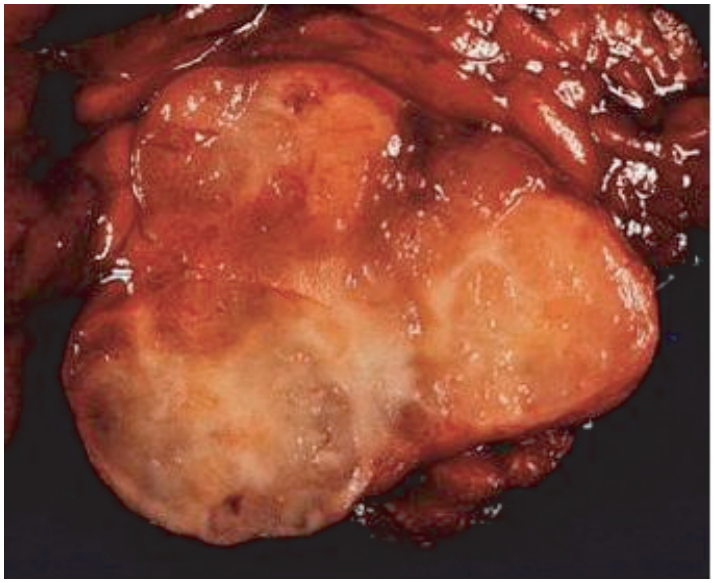


Anteromedial surface

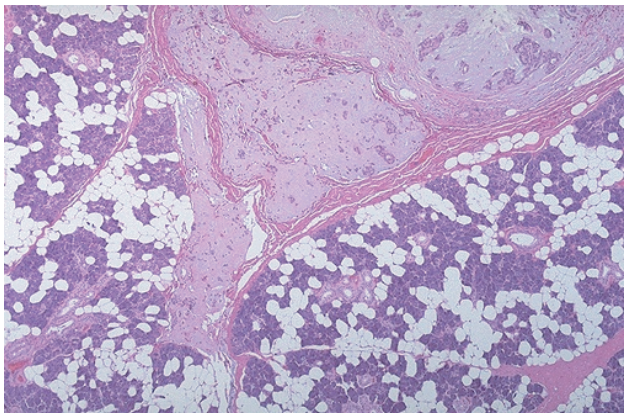


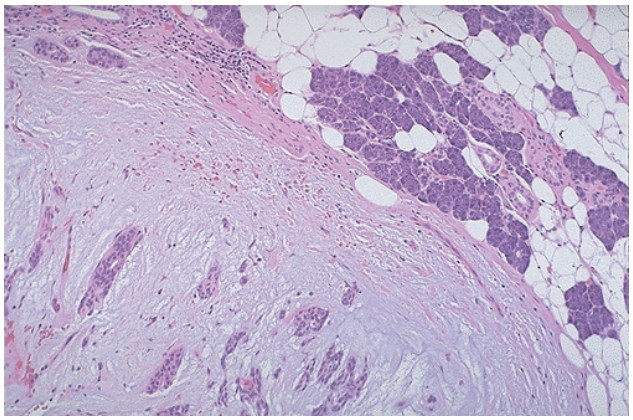
Posteromedial surface

CLEOMORPHIC ADENOMA



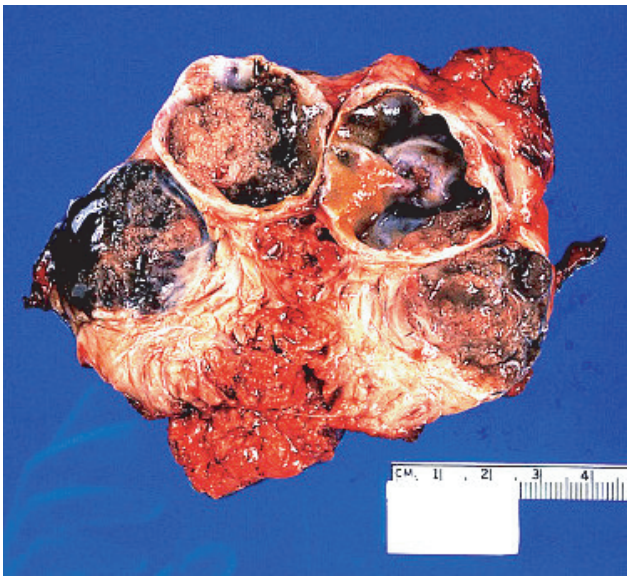
GROSS



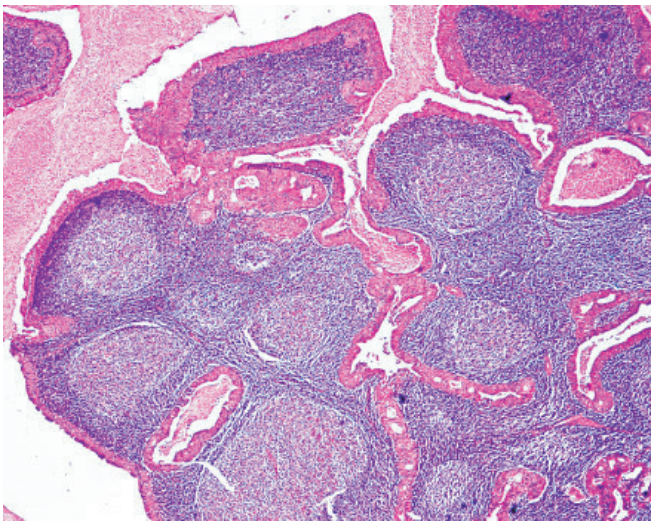


MICROSCOPIC

WARTHINS TUMOUR



GROSS



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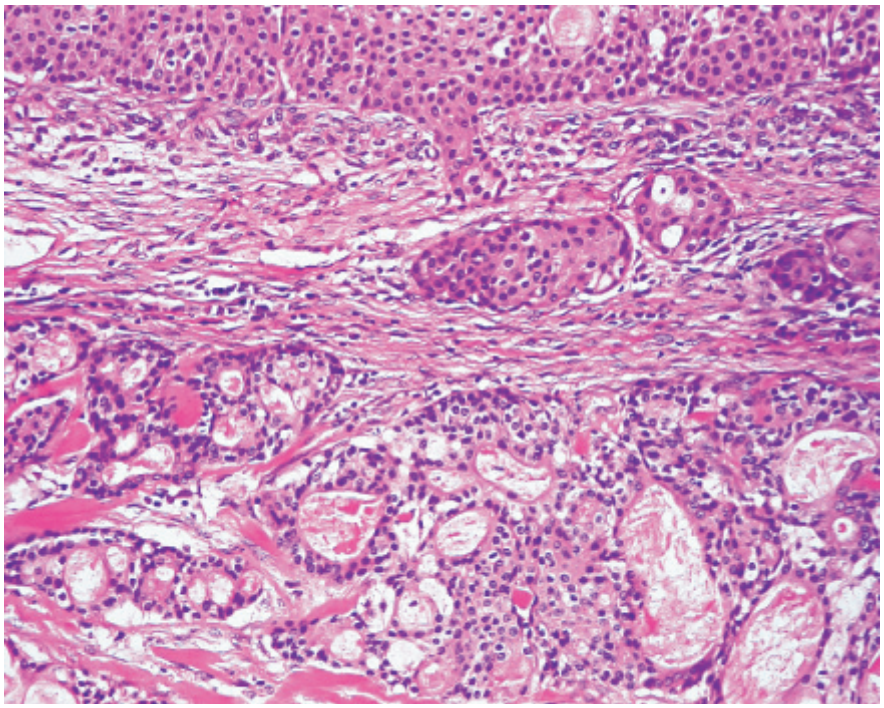
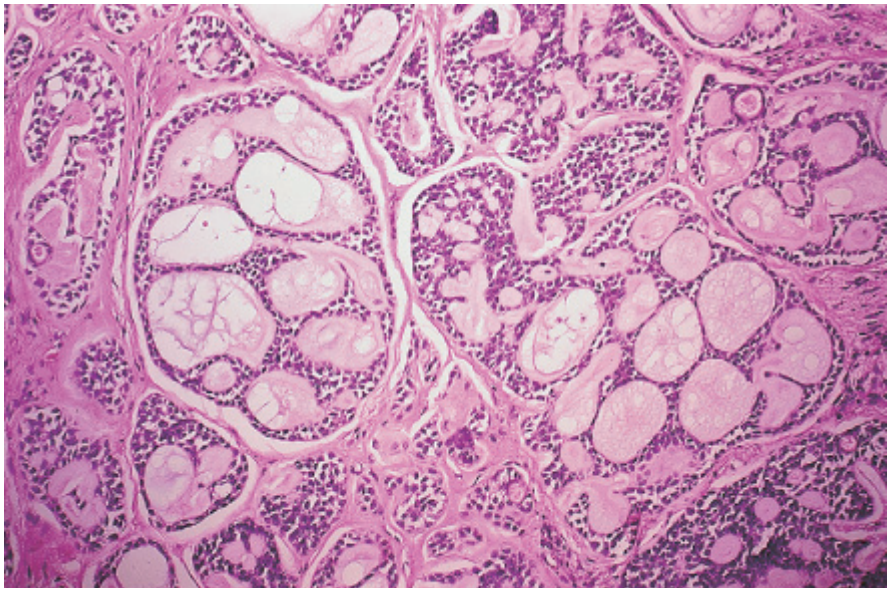
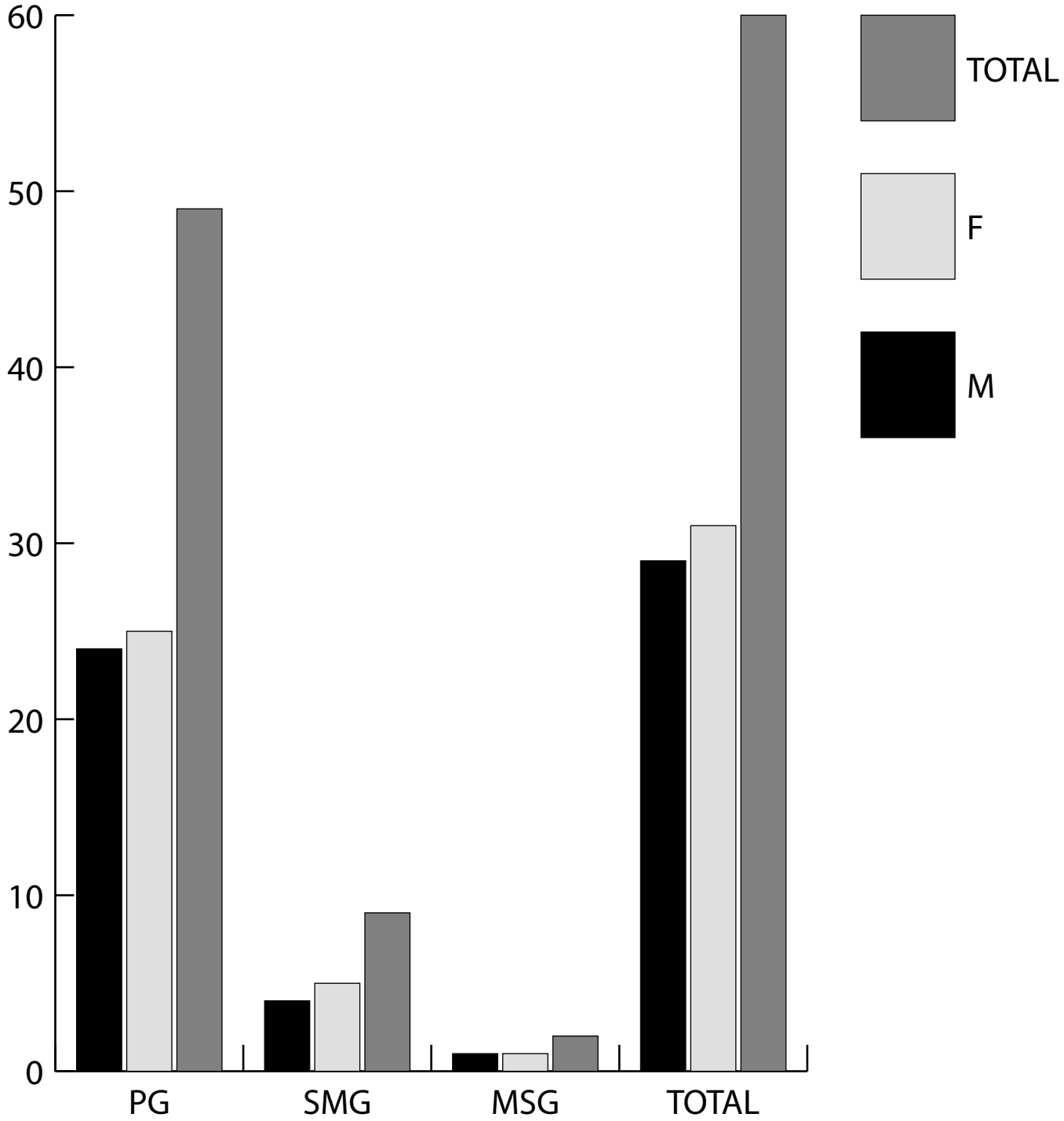


MUCO EPIDERMOID CA



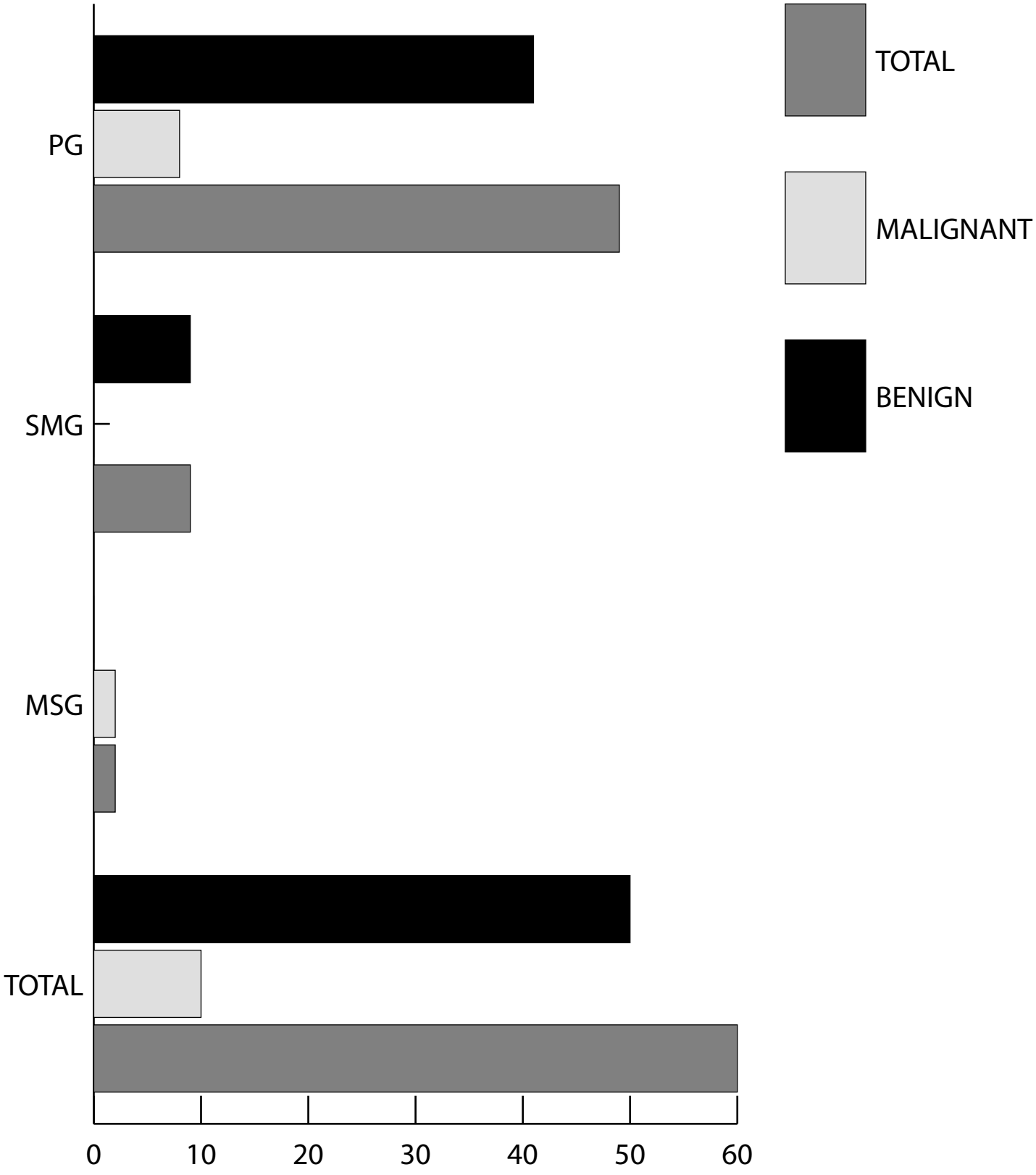
ADENOID CYSTIC CA

SEX STRATIFICATION OF SALIVARY GLAND TUMOURS



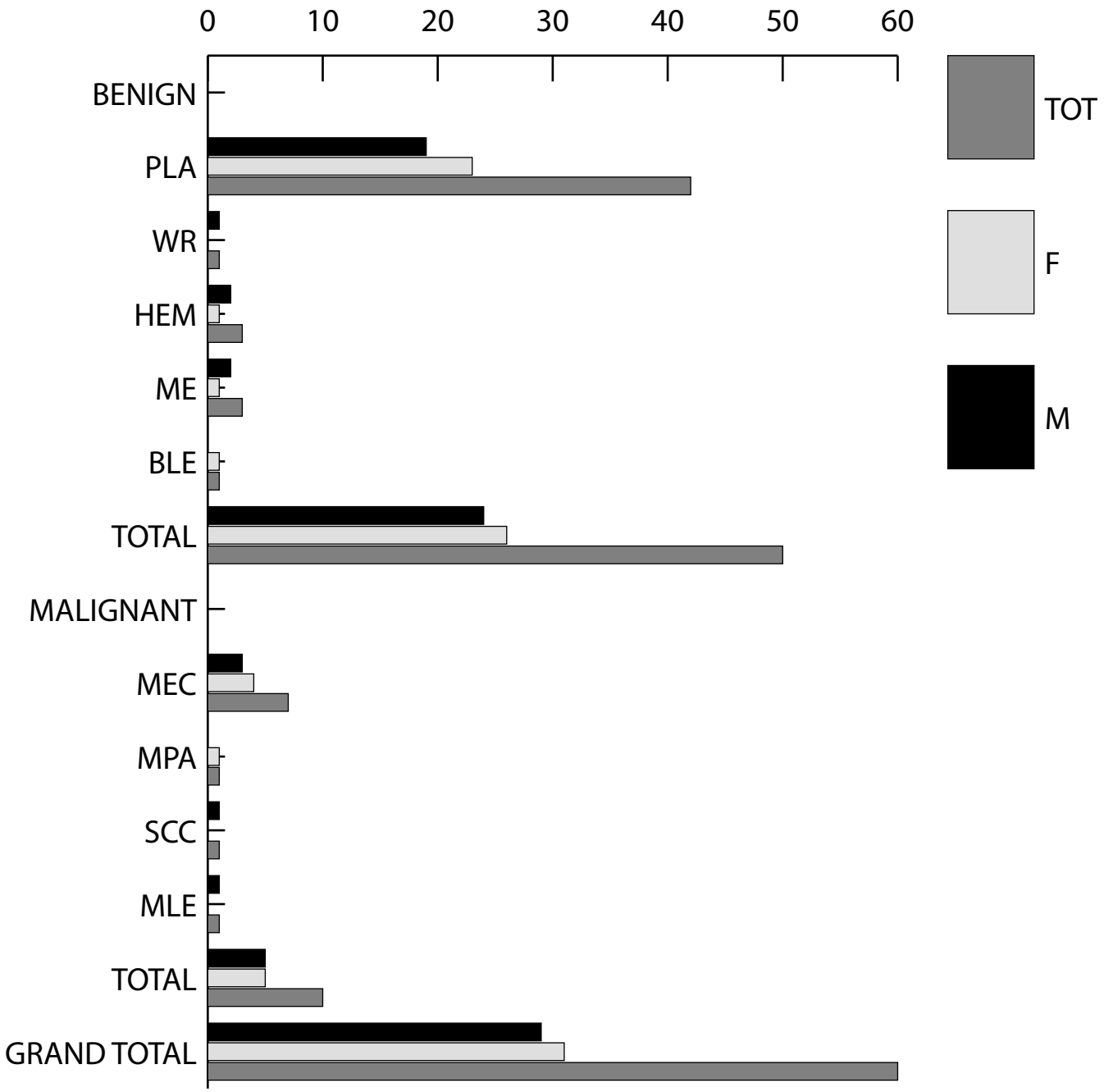
PG = PAROTID GLAND SMG = SUBMANDIBULAR GLAND
MSG = MINOR SALIVARY GLAND

INCIDENCE OF BENIGN vs MALIGNANT TUMOURS IN VARIOUS SALIVARY GLANDS



PG = PAROTID GLAND SMG = SUBMANDIBULAR GLAND
MSG = MINOR SALIVARY GLAND

PATHOLOGICAL TYPES



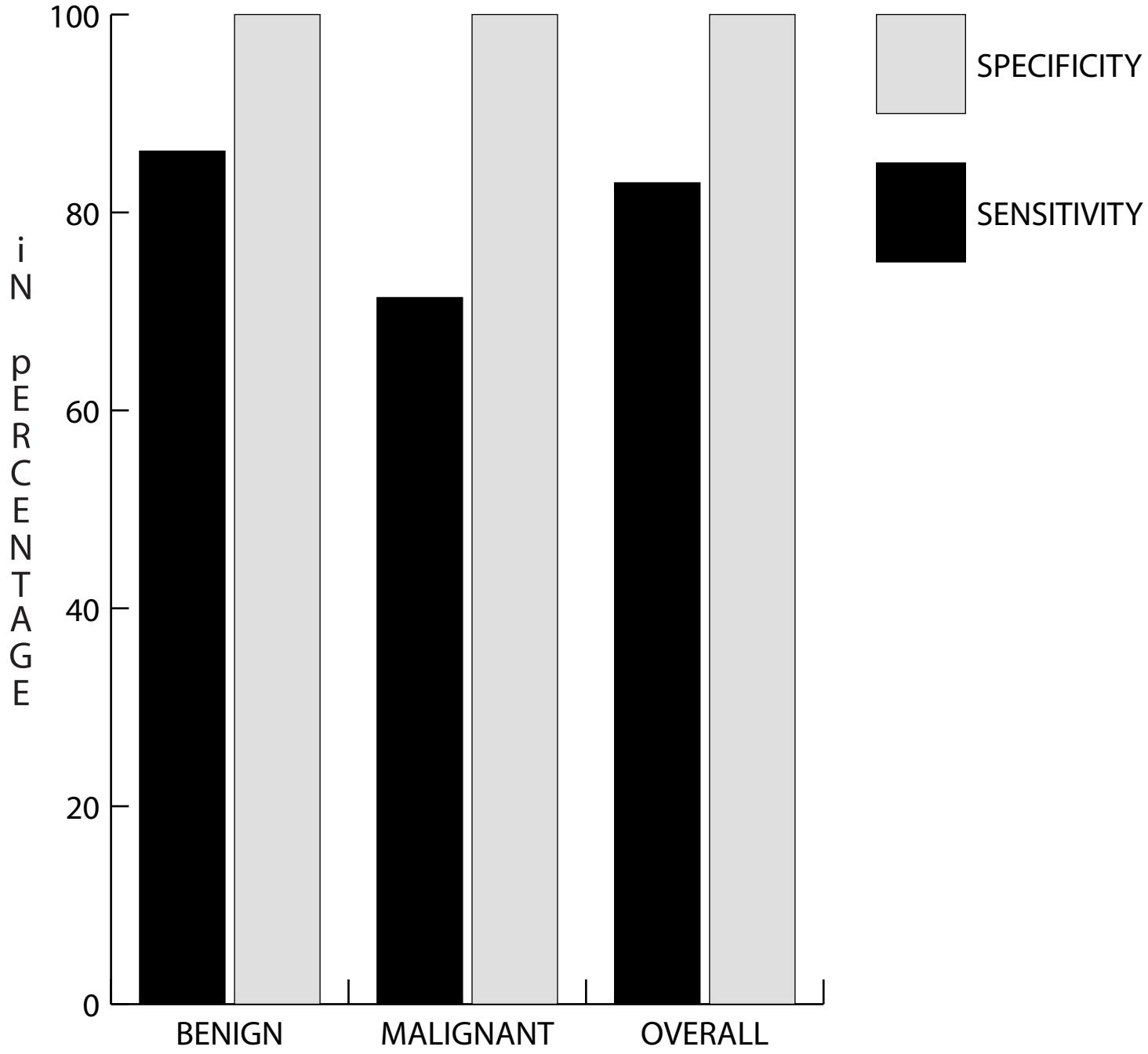
PLA = PLEOMORPHIC ADENOMA WR = WARTHIN'S TUMOUR HEM = HEMANGIOMA ME = MYOEPITHELIOMA

BLE = BENIGN LYMPHO EPITHELIOMA MEC = MUCO EPIDERMOID CARCINOMA

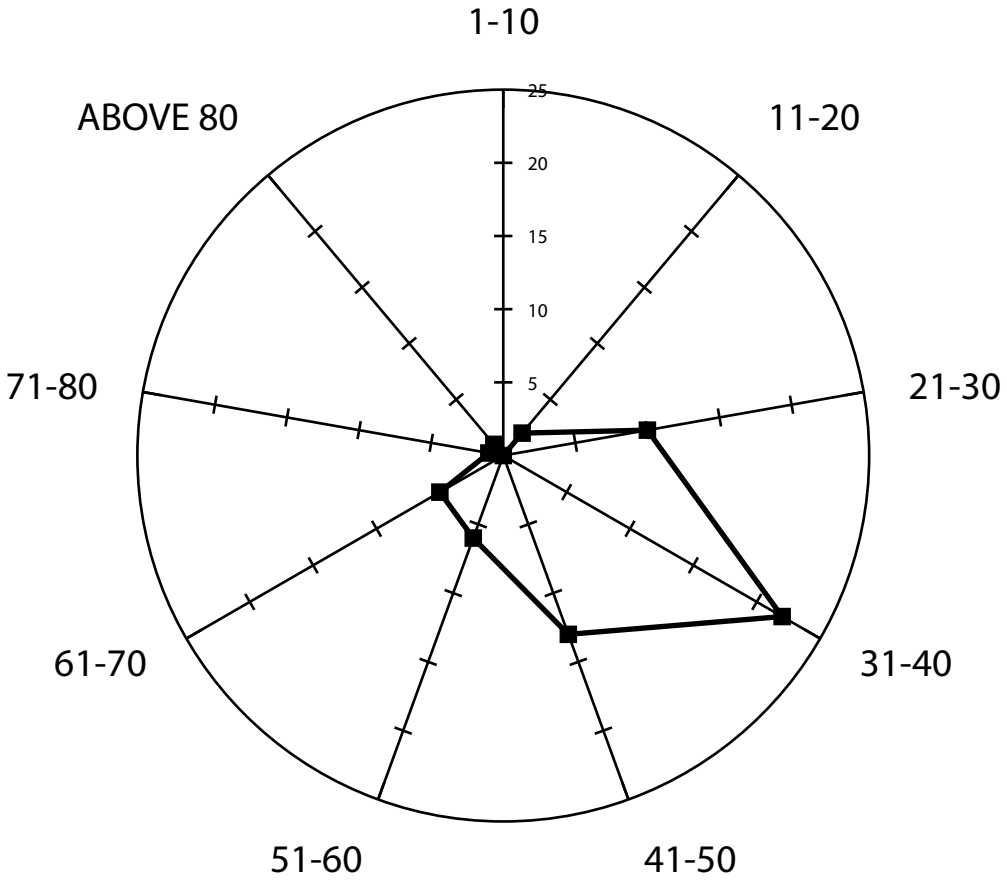
MPA = MALIGNANT PLEOMORPHIC ADENOMA SCC = SQUAMOUS CELL CARCINOMA

MLE =MALIGNANT LYMPHO EPITHELIOMA

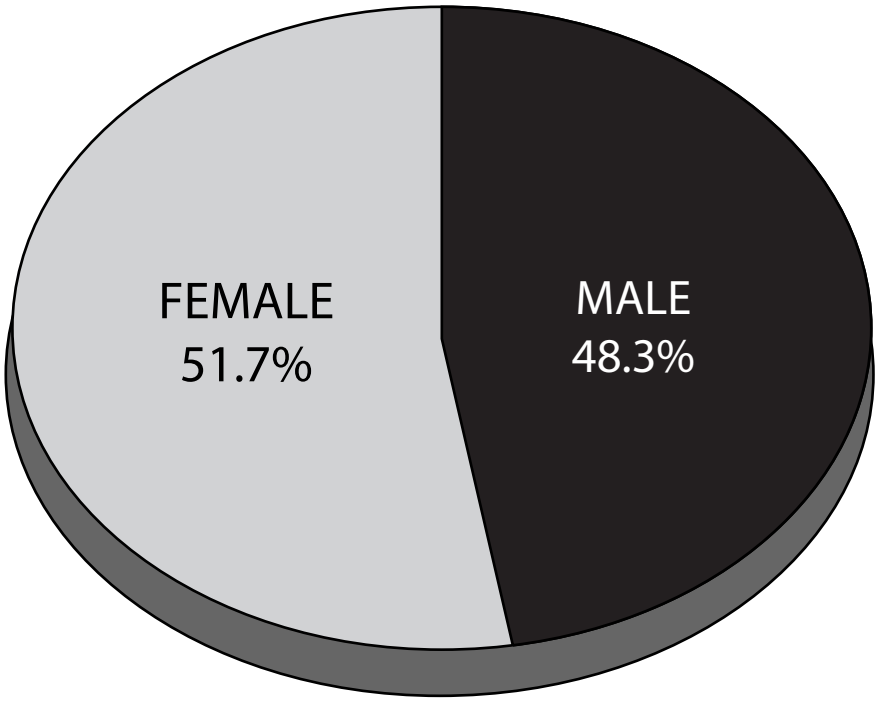
FNAC - SENSITIVITY AND SPECIFICITY



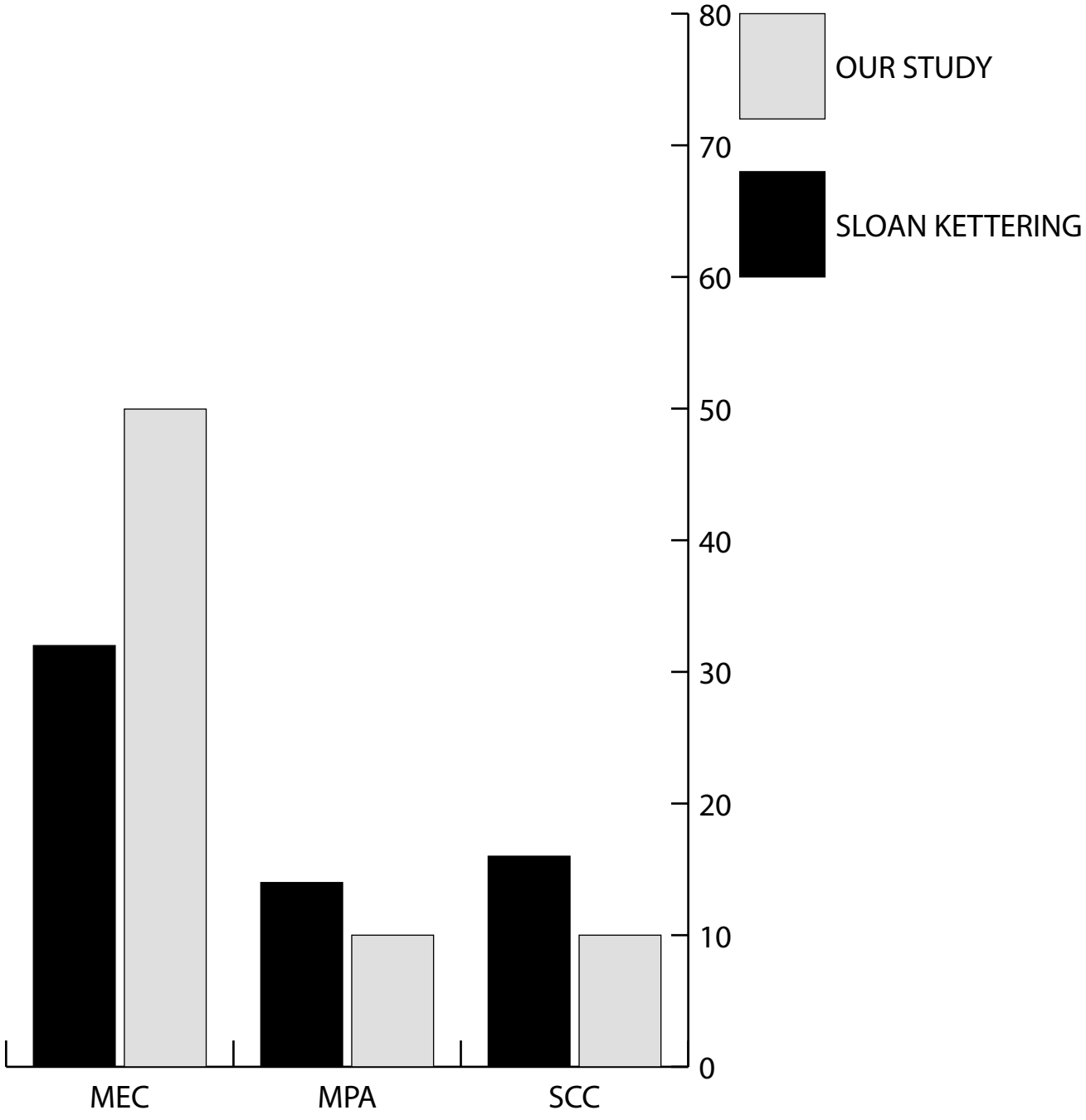
AGE STRATIFICATION



SALIVARY GLAND TUMOURS MALE FEMALE RATIO

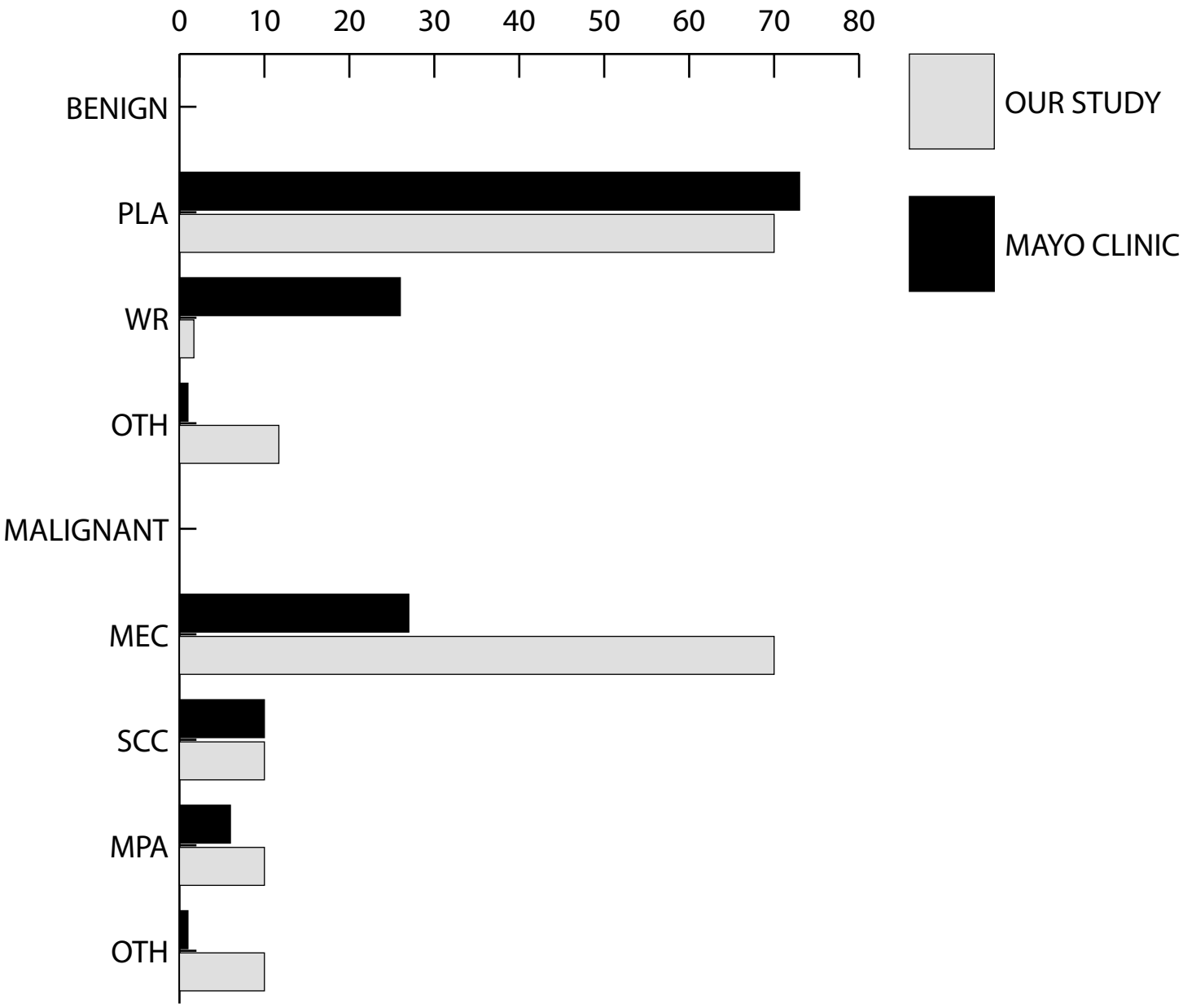


COMPARATIVE STUDY OF HISTOLOGICAL TYPES OF PAROTID CARCINOMA
(In percentage)



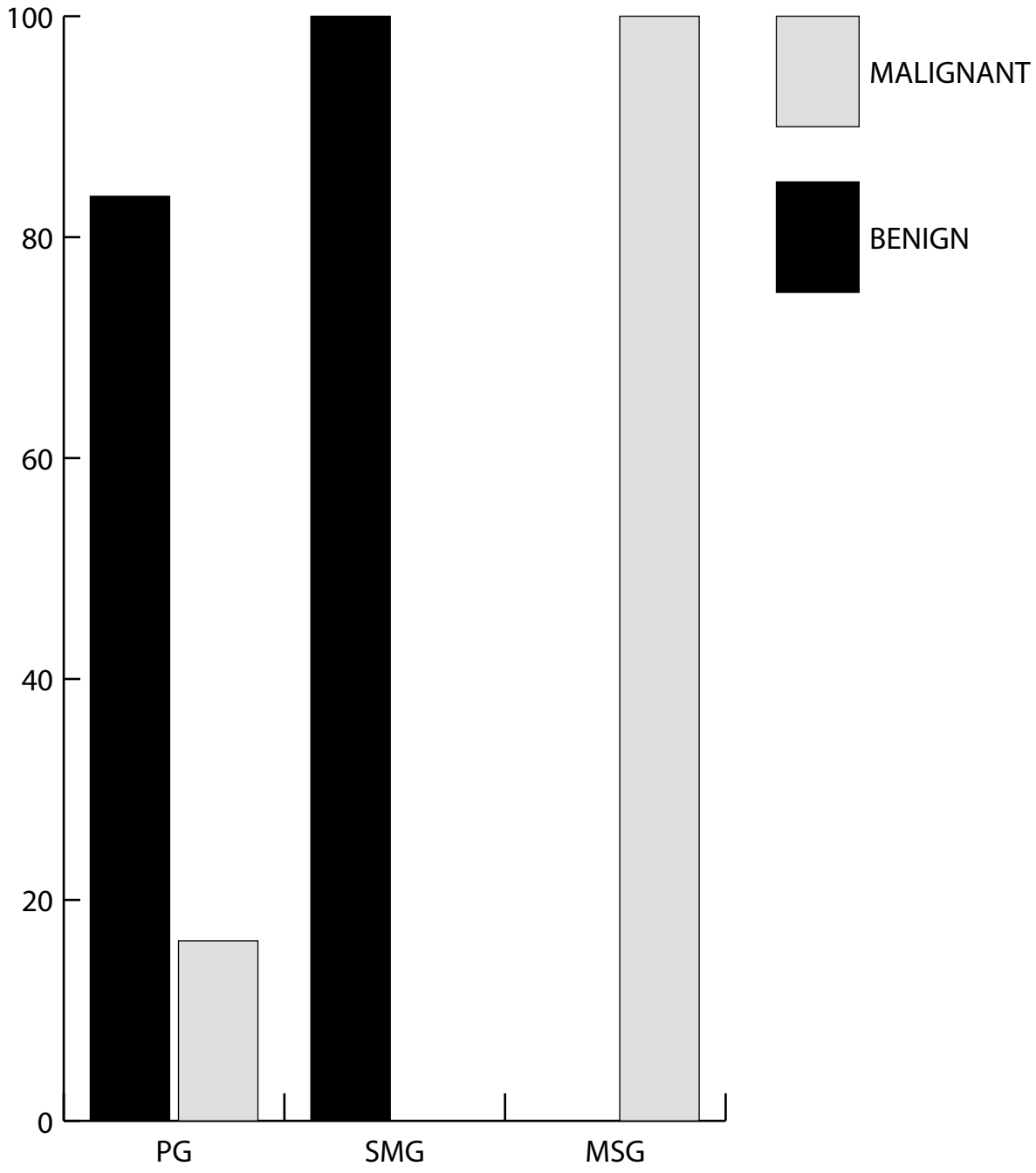
MEC = MUCO EPIDERMOID CARCINOMA MPA = MALIGNANT PLEOMORPHIC ADENOMA
SCC = SQUAMOUS CELL CARCINOMA

BENIGN Vs MALIGNANT TUMOURS - COMPARATIVE STUDY



PLA = PLEOMORPHIC ADENOMA
WR = WARTHIN'S TUMOUR
MEC = MUCO EPIDERMOID CARCINOMA
MPA = MALIGNANT PLEOMORPHIC ADENOMA
SCC = SQUAMOUS CELL CARCINOMA
OTH = OTHERS

PERCENTAGE OF BENIGN AND MALIGNANT TUMOURS IN VARIOUS SALIVARY GLANDS



PG = PAROTID GLAND SMG = SUBMANDIBULAR GLAND
MSG = MINOR SALIVARY GLAND

INCIDENCE OF MALIGNANT TUMOURS IN VARIOUS SALIVARY GLANDS